Issued Weekly by the

Hill Publishing Company

JOHN A. HILL, Pres. and Treas. ROB'T MCKEAN, Sec'y.

505 Pearl St., New York.
6 Bouverie St., London, E. C.
Unter den Linden 71, Berlin.

Subscriptions payable in advance, $5.00 a year for 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii, or the Philippines, $6.50 in Canada.

To foreign countries, including postage, $8.00 or its equivalent, 33 shillings: 33 marks: or 40 francs.

Notice to discontinue should be written to the New York Office in every instance.

Advertising copy should reach New York Office by Thursday of week before date of issue.

Entered at New York Post Office as mail matter of the second class.

Cable Address, Engminjour, N. Y.

CIRCULATION STATEMENT

During 1910 *we printed and circulated* 526,500 *copies of* THE ENGINEERING AND MINING JOURNAL.

Our circulation for January, 1911, *was* 41,500 *copies.*

February 4	11,000
February 11	10,000
February 18	10,000
February 25	9,750

None sent free regularly, no back numbers. Figures are live, net circulation.

Contents

PAGE

Editorials:
The Postal Danger 401
The Waihi Gold Mine 401
Weight of Gravity Stamps 402
Australasian Gold in 1910 402
Rail Production in the United States .. 402
The New Copper Production 402
Correspondence and Discussion: Tradition in Mining....Rolling and Forging Manganese Steel....An Explanation of the Effects of Some Explosions....Quicksilver Mines in the United States....Heating Cyanide Solutions....The Cost of Melting Pig Iron 403
The Katanga Copper Mines 405
Canadian Mining Institute 405
Developments at Jarbidge. *Winthrop W. Fisk* 405
Details of Practical Mining: *Dewatering Slime Samples....Mine Tailings for Ballast....*An Explosion Indicator....Inspection Department of the Goldfield Consolidated ....*A Bushing for Stamp Stems ....*Method of Mining Swedish Iron Ores....*Determining the Amount of Rope Wound on a Drum 407
Rail Production in 1910 411
British Mining Investments in Mexico. *Alfred James* 411
*Western Phosphate Legislation. *Claude T. Rice* 413
*Hindered Settling Classifiers. *Robert H. Richards* 415
Upward Leaching of Sand. *H. T. Durant* 417
*Adobe Furnace in the Sonora Valley... 418
The Quicksilver Industry in Texas. *William B. Phillips* 419
*Steam Shovel Work on Mesabi Range. *Albert H. Fay* 420
*The Maikop Oilfield, South Russia. *P. C. A. Stewart* 424
Vanadium in Sierra County, New Mexico ..... *Brigham Leatherbee* 426
The Use of Explosives in Coal Mines.... 427
Anthracite Shipments for 90 Years..... 427
*Operations and Equipment in Marianna Tipple 428
Criticism of Illinois Coal Mining. *David Ross* 430
Colliery Notes 431
Patents 432
Personal, Obituary and Societies 433
Editorial Correspondence 434
Mining News 436
Markets 441

Illustrated.

The Engineering and Mining Journal

FEBRUARY 25, 1911.

The Postal Danger

The U. S. Post Office Department suffers from politics. Politics and business methods do not mix any better than oil and water. The postal service, which is a monopoly transacting a huge volume of business, ought to be conducted at a profit, as in foreign countries. But because of its bad management the U. S. postal service shows an annual deficit.

The administration proposes to abolish the deficit at the expense of the magazines. By an amendment to the postal-appropriation bill, now before the Senate, the postage on the reading pages is to remain at the present 1c. per lb., but upon the advertising pages it is to be quadrupled. The weekly edition of a magazine like the JOURNAL weighs into the tons. Every producer knows the meaning of an increase from $20 per ton to $80 in the freight rate on his output. If the pending bill be enacted, every magazine in this country will be crippled. Many will be destroyed.

This is not merely a concern of the publishers. It goes further than them and hits the readers and the public. Those who are proposing this change in rate do not comprehend the effect it would have.

Technical magazines are a necessity of industry, which would become stagnant without such means for the dissemination of knowledge. They obtain their circulation because of the demand for the assistance they render. Their circulation attracts advertisers. Their advertisements enable them to supply the costly information that technical readers require. If their means of performing their function be crippled, their readers must suffer.

The Postmaster-General attributes the whole blame for his deficit upon the second-class matter. He says it costs 9c. per lb. for its transportation. His figures have been proved to be fallacious. His department has no definite way of determining this cost. Upon the authority of a member of the Railroads' Committee on Mail Pay the actual cost is probably only about 0.9c. per lb. The magazines are not asking for a privilege at the expense of anybody, but are simply fighting an act of injustice.

If the Postmaster-General really thinks that this service costs 9c. per lb. and is performed at a loss, why does he exempt the magazines shipping less than 4000 lb. per issue?

How does the Postmaster-General expect to increase his revenue if he kills off a large part of his business? What we need is a permanent director of postal service, the introduction of modern administrative methods, and the elimination of political incompetency.

Every reader of the JOURNAL is concerned in this contemplated outrage because it will affect every one of them. We urge every reader to communicate, by letter and telegram, with members of Congress, protesting against the consummation of this tax upon knowledge and the tools of many trades.

The Waihi Gold Mine

A parallel to some movements in this country is found in the recent course of Waihi stock in London, which has fallen from over £10 per share about the middle of 1910 to £3⅞ at the present time. Waihi is the great New Zealand gold mine, and one of the great gold mines of the world; for seven or eight years past it has been very prosperous. Since 1902 it has paid large dividends, the lowest being 55 per cent. in 1905 and the highest 90 per cent. in 1909. The price of the shares began to fall in London several months ago, under the pressure of disquieting reports and selling orders from New Zealand where a good deal of stock was held, and the decline has been continuous.

Now a definite reason for the fall and a confirmation of the unfavorable reports has appeared in the shape of a report from Mr. Williams, who has been making an inspection of the mine for the

company. He reports in substance that the development of the ninth level is extremely disappointing; tonnage must be reduced to 1000 tons per day; and dividends must fall from 90 to 40 per cent. perhaps less. There is no present prospect for improvement, though exploration is to be continued.

It is possible, of course, that the mine may recover; but from present reports it looks as if its best days were over. It does not appear, however, that stockholders have much to complain about, except those who bought at the high level last year. The managers made the report public without reservation as soon as the examination was completed. In the seven years 1903 to 1909, inclusive, the stockholders received 505 per cent. on the par value of their shares in dividends, and they had ample opportunity for the amortization of their original investment, if they were disposed to take advantage of it.

Weight of Gravity Stamps

In several small mills recently contracted for in this country, there is exhibited a decided tendency toward the use of heavier gravity stamps than have been the established practice. A 10-stamp mill now being erected in Nevada is equipped with 1400-lb. stamps; another with 1300-lb. stamps; and we understand that the Candor company in North Carolina has contracted for a 5-stamp mill with 1750-lb. units. However, among the larger mills of the United States the most approved weight of stamp at present is 1050 lb. At the Combination mill at Goldfield, Nev., 1250-lb. stamps were used, but this mill has been dismantled and when the new mill of the Goldfield Consolidated was erected, 1050-lb. stamps were installed. It may therefore be said that generally speaking, the tendency in the United States has been not to increase the weight of the gravity stamp; indeed, in some quarters, it trends rather toward the elimination of the stamp and the substitution of rolls and some other form of fine-grinding mill.

There are certain of our gold-mining fields, however, that are not likely to discontinue the stamp. In Mexico, the South African practice is making more headway. Three large mills in El Oro district, the Esperanza, El Oro and Dos Estrellas, are either using or arranging to install 1250-lb. stamps. Heavier stamp equipment is used in the Pachuca district, and it is reported that the new Santa Gertrudis mill will have stamps weighing 1500 lb. The Providencia mill in Guanajuato is installing 1600-lb. stamps. In Canada, two mills with 1500-lb. stamps have been brought to our attention, one being the Nova Scotia at Cobalt; the equipment for the other is at present being shipped to a Porcupine property. What will probably be the heaviest installation of gravity stamps on this continent is the recent shipment of twenty 1800-lb. stamps for the New York & Honduras Rosario mill in Honduras.

Australasian Gold in 1910

The production of gold in the Commonwealth of Australia and New Zealand has now been reported almost in full for the year 1910, and the total is close to the estimate given in the JOURNAL for Jan. 7. The output by States is given in the accompanying table, in fine ounces.

	1909.	1910.
West. Australia.....	1,595,263	1,470,632
Victoria	654,222	610,000
Queensland	455,577	438,900
New South Wales...	204,709	225,172
Tasmania	44,777	46,500
South Australia.....	7,500	8,100
Commonwealth ...	2,962,048	2,799,304
New Zealand.....	485,179	478,287
Total	3,447,227	3,277,591
Total value.....	$71,254,182	$67,747,806

The returns are all complete except for Tasmania and South Australia, which together produce less than 2 per cent. of the Australian total. The total decrease in 1910, as compared with 1909, was 4.9 per cent.; but the 1910 output shows a decrease of $21,458,943, or 24.1 per cent., from the maximum production, which was reached in 1903, when the great mines of Western Australia were at their best. Since 1903 gold production has declined steadily, but gradually. No new districts have been opened and the older mining regions, especially in Western Australia, have failed to keep up to their maximum output.

The hope for the future is founded largely on the possibilities of some of the outlying districts. There is also a prevalent rumor that in the practically unknown coast regions there are several Chinese settlements where placer gold is obtained and carried off to China, escaping all notice or record by the government. This rumor is based on the accidental discovery of one such working; but no others have been found, and no systematic search has ever been made.

Rail Production in the United States

For a large part of last year there were complaints that the railroad companies were holding out of the market, refraining from purchases and postponing repairs and extensions. Nevertheless the American Iron and Steel Association reports that the total make of rails in 1910 was 3,634,026 tons. This was 610,184 tons more than in 1909; it was 374 tons less—or practically the same—than in the prosperous year 1907; and it was only 343,858 tons less than in 1906, when our maximum production of rails was recorded. This is only another proof that while we were complaining of dull trade last year, we were actually making very large productions; and the dullness was not measured by comparison with what had been done in previous years, but with what we had expected and prepared to do.

A noticeable feature of the year's production was the increase in the use of open-hearth steel. Only four years ago over 90 per cent. of our rails were made of bessemer steel. In 1909 the proportion of open-hearth rails was 41.5 per cent. of the total, and in 1910 it rose to 47.2 per cent. This is the result of the controversy over quality and rail specifications; largely also of the extension of open-hearth steel making at Gary, Bethlehem and Ensley.

The New Copper Production

The communication respecting the situation at the copper mines of Katanga, published elsewhere in this issue, comes from a well-informed correspondent, and may be relied upon as stating the precise facts. It is quite clear from this statement that Katanga copper is not going to cut any great figure in the market of 1911.

Two months of 1911 have now passed away and not a pound of the new production that has been so much dreaded has yet materialized. We may reasonably look for a little of it to become available this year, but it seems now that under the most favorable circumstances none will be ready for delivery in refined form until after midyear. A better estimate as to this can be made after the Ray and Miami mills get into action.

Correspondence and Discussion

Tradition in Mining

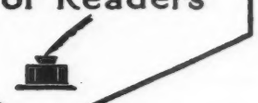
The question of the effect of tradition on the mining practice of a camp has often been discussed by engineers, many maintaining that it is lack of tradition that accounts for the antiquated methods that often characterize the operations of important camps. I take issue with this view and claim, to the contrary, it is rather a redundance of tradition and lack of perspective that in most instances causes the clinging to old and uneconomical standards. My observations in the various mining regions of the United States and Canada seem to warrant this opinion and to my mind prove the correctness of the conclusion.

Probably the most forceful example of the foolish clinging to tradition that I have observed is in the work of the old Comstock miners in other camps to which they have migrated. No one can question the fact that in Virginia City has been developed a class of miners probably without peer in the holding of heavy ground and working under almost unbearable conditions. The square-set timbering of these men has attracted world-wide notice, and rightfully. However, everywhere the Comstock miner has gone is to be observed the results of his almost insane desire to "put in timber." In the Blue Stone mine at Yerington, only last year all timbering was removed from stopes that had stood for a number of years. Those stopes require no timber now, other than occasional stulls, yet they were filled with expensive square sets. This same thing was done in early days at the Homestake, where even yet unnecessary timber is being recovered from old stopes. Anyone who has been through this mine and seen the huge open stopes of more recent days can realize how useless was most of the early timbering.

The milling practice on the Mother Lode of California is another example of this clinging to tradition. From the beginning the scheme of milling has been stamping, amalgamating and concentration on vanners. Lately, when there has been a tendency toward the introduction of more uptodate methods and machinery, the forward ones have had to fight at every turn unreasoning prejudice due to tradition. It is said that when Deister concentrators and a Richards classifier were introduced at the Original Amador at Amador City, it was almost impossible to get any of the old mill men to give the new equipment a fair chance. And failure was predicted by all of the wiseacres.

The same conditions have prevailed at the Melones, at Melones in Calaveras

Views, Suggestions and Experiences of Readers



county, and the Argonaut at Jackson, Amador county, where energetic engineers of the newer school have introduced and enforced uptodate mining methods despite the protests of the blind followers of tradition. Have you ever had to deal with any of the old "Cousin Jack" miners from Grass Valley? If so, you need no one to tell you how a man will, against all reason, insist on working in his own way because that way happens to be the way he has always done. It is no joke trying to show one of these fellows why your idea is better, either.

The Cœur d'Alene region is famous, on account of the long adits and huge underground hoisting plants, yet when you have a Cœur d'Alene engineer insist on cutting a station and installing a hoisting plant underground when there is already a hoist 140 ft. above at the collar of the shaft, you begin to realize how such following of traditions will narrow a man's judgment. In this case it was only necessary to put in an ore pocket at the adit level without changing any of the old equipment.

I can recall numerous instances of the costly results from lack of perspective in following the dictates of tradition. Even in the great Homestake mine of South Dakota probably 10 to 15c. could be saved on each ton mined by loading tramcars with ore from filled stopes by a method that would eliminate shoveling off the floor. This is accomplished elsewhere, i.e., at the mines of the Tennessee Copper Company, where underground grizzlies are used with success.

However, these changes are hard to bring about and cannot be effected in a day. Few of us are willing to profit by the other fellow's lesson, and the Comstock miner will follow his traditions and put in square sets no matter how good the back; the man from the Cobalt region will insist on surface trenching as the only method of prospecting, etc.; each blindly follows his precedents until a man comes along who has the breadth to see the worth of the methods of each of the other and the strength and ability to break the bonds of tradition and use only those ideas which are best suited to the conditions at hand. It is a whole lot easier to follow the beaten path than it is to break a new trail.

JOHN TYSSOWSKI.

New York, Feb. 20, 1911.

Rolling and Forging Manganese Steel

A strange idea has become prevalent that the rolling and forging of manganese steel have, until lately, been thought to offer insuperable difficulties. The *Engineering Record,* Jan. 21, says: "The rolling and forging of manganese steel was declared to be impossible by most steel works for some years after the Taylor Iron and Steel Company had established manganese-steel castings on the American market."

Now, in fact, no insuperable difficulty has ever been supposed to exist by those familiar with the subject. To select a few cases, in a paper before the Franklin Institute, Feb. 20, 1892, I devoted nearly a page to the rolling and forging of manganese steel, and gave no hint of any serious difficulty in carrying out these operations. In particular I said: "Manganese steel may be rolled hot into sheets as thin as No. 18 gage, 0.049 in., without special difficulty; and it has been rolled hot to No. 28 gage, 0.014 in., but with difficulty, for very frequent annealing is needed. It has been rolled cold into much thinner sheets, but it hardens quickly in cold rolling, and must be annealed often. It has been drawn into wire, 0.0105 in. thick, or of No. 31 B.w.g., No. 30 American wire gage."

Most of the foregoing work I myself witnessed, and much further like work was described to me by Sir Walter Hadfield. Of course, the mere fact that such thin sheets and wire could be made is proof positive that the metal could be rolled to the larger sizes through which it must have passed in order to reach these fine sizes. In a paper before the American Institute of Mining Engineers, 1893, Vol. 23, page 10, I gave a table showing the results of treating "Rolled Manganese-Steel Strips." Sir Robert Hadfield gave particulars about forged manganese-steel car axles on pages 183 and 184 of his paper before the American Institute of Mining Engineers, 1893, Vol. 23. On page 185 of the same work he refers to rolled manganese-steel tires; and on pages 174 to 185 he gives the results of experiments on forged manganese steel.

HENRY M. HOWE.

Columbia University, New York, Feb. 18, 1911.

An Explanation of the Effects of Some Explosions

Having read an article in the Feb. 11 issue of the JOURNAL on the explosion of the Granite mine at Victor, Colo., and the curious effects produced by it, as for example the breaking of two wooden doors, while a plate-glass window between them was left unharmed, I beg to suggest that these effects are easily explained on well known physical principles, and are in fact about what we should be led to expect. I refer to the classic illustration of air vibrating in an organ pipe, the effect being to produce a series of nodes and antinodes, the former being those points where the air in the pipe is not in motion, but experiences successive condensations and rarefactions, while the antinodes are points where the density of the air is unchanged and its vibratory movement is a maximum. At the nodes, the manometric flames and the sand on a diaphragm constituting part of the wall will dance most vigorously, while sand on a diaphragm suspended in the tube will remain inert at the nodes, and will dance most vigorously at the antinodes.

These effects are produced solely by reflection, and where there is no reflection, that is to say, where the sound waves travel unimpeded, there can be no effects causing greater violence of action at one point than at another. Naturally the case of explosion referred to is not so simple as that of an organ pipe, on account of the irregular disposition of the obstacles met by the explosion waves. Of course if the explosion occurs on a street surrounded on both sides by high buildings, the destructive effects would probably be found to occur periodically at intervals equal to a wave length. But in the general case the reflected waves will meet the advancing waves at irregular points, so that the positions of nodes and antinodes will be irregularly disposed. Generally speaking, however, any rigid surface that faces the advancing wave at right angles will experience the greatest shock, there being a node at this point, giving double the effect produced where the surface stands parallel to the wave movement.

Likewise rigidity is necessary to violent disturbance. The maximum amplitude of vibration in explosions is probably extremely minute. In earthquakes it is usually but a fraction of a millimeter, and seldom exceeds five or six millimeters. The vibration occasioned by the explosion of dynamite is probably of a like order of magnitude, and its violence is due to its suddenness, which gives excessive compression and rarefaction on a small scale. Surfaces, therefore, like a plate-glass window of considerable size and not too great thickness may have sufficient elasticity to yield to the vibrations and will be less likely to be shattered than a set of small panes in a sash, or than a rigid wooden door. It is almost a safe inference, by the way, that the doors mentioned were closed tight at the time.

The length of the waves may be estimated from the tone of the sound and to fix ideas, if this gives 100 vibrations per second, the waves traveling at 1100 ft. per sec. will have a length of 11 ft.; therefore any node effect should make itself felt at recurrent intervals of this order of magnitude.

We have a quite analogous condition in the apparently capricious action of lightning, which is admittedly due to like causes. Alternating-current circuits furnish similar conditions, resulting in the "resonance effect" which may carry the voltage at a distant point higher than that generated.

GEORGE W. COLLES.

Milwaukee, Wis., Feb. 14, 1911.

Quicksilver Mines in the United States

Can you give us a list of all the quicksilver mines in the United States which are at present in operation? Also the dividends paid by them in 1910?

G. A. L.

New York, Jan. 26, 1911.

Most of the quicksilver mines are privately owned, or controlled by close corporations, and their profits are not made public. The only record of dividends paid is that of the New Idria Quicksilver Mining Company, which paid $120,000 or 24 per cent. on its capitalization in 1910. The following list of quicksilver mines is thought to contain all that are working, besides a few at present closed down, but which have been producers in the past: Marfa & Mariposa Company, Chisos Mining Company, Terlingua Mining Company, Colquitt-Tigner Quicksilver Mining Company, Big Bend Cinnabar Mining Company, all of Terlingua, Tex.; Texas-Almaden Mining Company, Big Bend, Tex.; Altoona Quicksilver Mining Company, 333 Kearney street, San Francisco, Cal.; Culver-Baer Quicksilver Mining Company, Cloverdale, Cal.; New Guadalupe Mining Company, Los Gatos, Santa Clara county, Cal.; Sierra Morena Mine, Paso Robles, Cal. (N. S. Kelsey, supt.); Twin Peaks Mine, Oathill, Napa county, Cal.; Great Eastern Quicksilver Mining Company, Mercury, Sonoma county, Cal.; New Almaden Quicksilver Mining Company, New Almaden, Santa Clara county, Cal.; F. V. Layton, 254 S. Broadway, Los Angeles, Cal.; New Idria Quicksilver Mining Company, 200 Davis street, San Francisco, Cal.; Wall Street Mine, Middletown, Lake county, Cal.; Great Western Quicksilver Mining Company, 114 Battery street, San Francisco, Cal.; Oceanic Quicksilver Company, 363 New High street, Los Angeles, Cal.; St. John Quicksilver Mining Company, Vallejo, Solano county, Cal.; E. E. Bray, Santa Clara, Cal.; Socrates Consolidated Mining Company, Monadnock building, San Francisco, Cal.; Helen mine, Middletown, Lake county, Cal.; Aetna mine, Lawley brothers, Calistoga, Napa county, Cal.; Sacramento Gold Mining Company, Auerbach building, Salt Lake City, Utah; Shoshone Quicksilver Mining Company, Salt Lake City, Utah; Black Butte Quicksilver Mining Company, Black Butte, Ore.; Cinnabar mine, Quartzite, Arizona.

Heating Cyanide Solutions

I notice frequent reports of disarrangement and stoppage of cyanide plants on account of unexpected freezing weather. It seems to me that this nuisance is unnecessary and avoidable. In all districts where there is the slightest liability of such cold weather provisions should be made to prevent the freezing of solutions in, and the conequent bursting of the pipes. It is a simple matter to arrange steam-pipe connections to allow the heating of solutions either in stock tanks, agitators or both; and if the temperature of the bulk of the solution is kept up there is little danger to be expected from pipes freezing. If there is no steam plant close to the mill a spare boiler of small capacity should be installed.

Not only does this arrangement provide against emergency but insures a better extraction as it is a well established fact that the dissolving of gold in cyanide solution is best effected when the temperature of the solution is high. (The proper temperature, considering loss of cyanide, should be determined). Probably the most satisfactory method of heating is by turning the steam directly into the solution.

J. K. HUDSON.

Tonopah, Nev., Feb. 10, 1911.

The Cost of Melting Pig Iron

There appears on page 310 of the JOURNAL of Feb. 11, the statement of a well known iron man, in part as follows: "It costs $2.50 per ton to melt pig iron. This cost the Steel Corporation saves by never letting its pig iron cool."

These statements are entirely true in the sense in which they were doubtless intended, namely, that it costs $2.50 per ton more to cast iron in the form of pigs at the blast furnace, handle and store it, and then remelt it for steel making, than it costs to transport it directly to the steel mill in the melted form. Only in this qualified sense, however, is it true that it costs $2.50 per ton to melt pig iron. The actual cost of melting pig iron in a cupola on a large scale is less than $1.75 per ton, starting with the purchased material.

BRADLEY STOUGHTON.

New York, Feb. 14, 1911.

The Katanga Copper Mines

JOHANNESBURG CORRESPONDENCE

Operations in Katanga have been greatly delayed. The railway got to the Star of the Congo mine on Oct. 2, 1910, and it was expected that the new smelting plant would be erected and ready for operation early in 1911. According to advices from the Congo, dating about the middle of January, there have been disappointments. The plant shipped from England reached Beira in good time, but up to the middle of January only a trifling part of the material required to get one blast furnace into running order had been landed at the smelting site.

The trouble has been due largely to excessive rainfalls. Ordinarily there are only a few thunderstorms up to the end of December, but this year there has already been 30 in. of rain. This has seriously damaged the earthwork of the new railway. The rails are wobbling and the rivers are up everywhere. The normal rains are but now beginning. Under normal conditions there will be another 40 to 50 in. of rainfall during the next three months.

There is no hope that smelting with the new plant can be bgun before next August, and very likely the beginning will be still later. The material for the entire plant, which is designed to produce about 1000 tons of copper per month, is now in Africa, but the trouble is getting it to the mine and getting it erected there.

The plant will comprise a blast furnace for the treatment of ore that is practically self-fluxing. A recovery of upward of 15 per cent. of copper is anticipated. The company has now, at the Kansanshi mine, about 2000 tons of pig copper produced from similar ore smelted in a blast furnace with charcoal. The company is buying coke for the larger works. It is reported that the smelting at Kansanshi has been done quite favorably, the slag having carried only 1 to 1.5 per cent. copper.

In the new plant, high-pressure blast from turbo blowers is to to be used, and the carbon-monoxide gas from the furnaces is to be collected for use as at Mansfeld and in general iron-smelting practice.

The plant for the treatment of the silicious ores, by reducing the copper in the ore to metallic form, and subsequently separating the metallic particles by washing, has been designed, and it is understood that the larger part of the machinery and material is all ready for shipment. However, the management seems to be subordinating this part of its plans in favor of the smelting plant, being evidently desirous to put itself into a position to make copper as soon as possible.

As for the mines, only that known as the Star of the Congo is being prepared for work. This mine has a large deposit, which is believed to be three-fourths of a mile long, and probably over 200 ft. in width. Three open cuts are being prepared, from which the ore will be hauled by endless ropes. With the exception of Kanbove, the other mines are idle. The total number of mines in the district, so far as known at present, is about nine.

It is expected that the railway will be extended to Kanbove, the work commencing this year. This is regarded by the company as its best mine, and when the railway reaches it, the company expects to be in a position to make a large output of copper.

At the company's headquarters things are already beginning to become civilized. Everyone going there had formerly to walk 400 miles from the end of the railway. The railway now goes right to the works. The former mud huts have given place to brick houses with iron roofs, and even there are two automobiles on the ground. Apart from the rain the climate is excellent. Several white women have arrived, and the conditions have already become much more congenial to the average man, yet even Katanga has its conservatives and lovers of nature who find objectionable features in the improvements, and look back fondly to the conditions which used to be, but perhaps they do not really mean what they say.

Canadian Mining Institute

The preliminary program for the annual meeting at Quebec shows that the opening session will be held at the Chateau Frontenac on Wednesday, March 1, at 10 a.m. The proceedings will be opened by addresses from Sir Lomer Gouin, premier, and C. R. Devlin, Minister of Colonization, Mines and Fisheries of the Province of Quebec. These speeches will be followed by the annual address of the president; general business and the reports of production of the Dominion and the several provinces. The afternoon will be spent at Montmorenci Falls. In the evening there will be a session for the reading of papers and discussion.

On Thursday, March 2, there will be morning and afternoon sessions for the reading and discussion of papers; and in the evening a smoking concert.

On Friday, March 3, there will be a session in the morning for the reading and discussion of papers; and in the afternoon another session for the same purpose and to dispose of any unfinished business. In the evening the meeting will be closed by the annual dinner of the institute.

The following nominations have been submitted by members of the institute. As no other nominations have been sent in, they will, in all probability, be elected without opposition: For president, Dr. Frank D. Adams, Montreal; vice-presidents, Dr. A. E. Barlow, Montreal, and T. Cantley, New Glasgow, N. S.; councillors, Dr. J. Austen Bancroft, E. Dulieux, Montreal; Theodore Dennis, Quebec; F. W. Gray, Glace Bay, N. S.; R. W. Brock, Ottawa; Arthur A. Cole, Cobalt; John Donnelly, Kingston, Ont.; G. E. Silvester, Copper Cliff, Ont.; E. T. Corkill, J. B. Tyrrell, Toronto.

Developments at Jarbidge

BY WINTHROP W. FISK*

That the orebodies of the Jarbidge district are going to hold up to the early promise in size and value, is being proved as development work progresses on the different properties now being opened up in this Nevada camp. Not that it is to be expected that the "hot-air" tales promulgated in the early days of last winter, are to be realized; those tales started a wild stampede and nearly killed a good mining camp, but the sober judgment of mining men who early examined the camp and predicted that it would in time make a big gold camp, is being amply justified. To the practical mining man Jarbidge never offered any sensational evidence of enormous values to be had for nothing; he saw evidences of wealth to be obtained by the expenditure of time and money by experienced mining men. That the camp is now making good, slowly and surely, there can be no longer be doubt. From Jack creek on the north to the Fifth crater, five miles south, and from Fall creek on the east to Bear creek, three miles west, there are now good deposits of ore opened up that can be examined by any one and which give solid and substantal proof that the gold is here and that it is only a question of development and reduction plants when a steady flow of bullion will be sent out from Jarbidge.

The Big Ledge claim, the Third Peak, the Bluster, Pavlak, Rainbow, Amazon and North Star are all showing veins of good promise.

Many other large bodies of low-grade and some smaller bodies of high-grade ore have already been opened and development work has hardly started in the camp.

The erecting of the Pavlak mill has been delayed somewhat by bad roads and slow movement of freight, but most of the material is now on the ground. The grading is completed and much of the foundation work is finished, while a large number of the timbers are framed ready to set up.

M. W. Conway and Thomas Curley, who have been working for some time on a lease on the block of ground south of the Pavlak shaft with indifferent success, having encountered only a fair grade of milling ore, have at last made a strike of

*Mining engineer, Jarbidge, Nev.

high-grade ore. On each side of their tunnel they now have a few inches of quartz that yields a long string of gold in the pan. This ore carries the coarsest gold yet found on the Pavlak vein.

Some fine pannings have been obtained from ore taken out of the Solo vein at the south end. The St. Joe tunnel is nearing the main vein; the spur which they have been following is showing more quartz and carries better values. The tunnel is now in 70 ft. George Fisher has taken a bond on the Elmore group of claims just north of and joining the North Star and expects to turn them over to a strong company.

A. S. Baty, of Jack Hole, has made a strike of fine ore to the northeast of Jack Hole, near the wagon road, about half a mile north of the Big Ledge and almost under the edge of the rim of the lava plateau which extends to the Snake river. This in on the strike of the Big Ledge vein and shows a large body of quartz some parts of which carry free gold. This find extends the Crater vein system for another half-mile or more.

Reduction Temperatures of Metallic Oxides

Various metallic oxides were submitted to the action of hydrogen, carbon monoxide, ammonia and methane, at various temperatures for a period of six hours, and the investigators report in the *Journ.* Soc. Chem. Ind., July 30, 1910, the lowest temperatures at which the oxides begin to lose oxygen. The accompanying tabulation shows the results obtained.

TEMPERATURES AT WHICH METALS GIVE UP OXYGEN.

Oxide.	Carbon Monoxide.	Hydrogen.	Ammonia.	Methane.
	Degrees C.	Degrees C.	Degrees C.	Degrees C.
Au_2O_3	0 and below	0 and below	...	...
Ag_2O	0	0	...	...
Hg_2O	0	80	67	220
HgO (yellow)	0 and below	50	...	...
HgO (red)	90	115	157	200–210
Pb_2O	...	...	202	202
PbO_2	110	150	198	45
Pb_3O_4	150	170	above 300	158
PbO	160	190	299	210
CuO	75	125	225	280
Cu_2O	...	...	208	230
CoO	140	...	...	...
ZnO	170	...	233	152–159
As_2O_3	60	...	...	...

Mine Rescue Work at Colorado School of Mines

The mine-rescue car of the U. S. Bureau of Mines on its trip through Colorado, stopped a week at Golden, so as to instruct the students at the School of Mines in such work. Along with the demonstration of the fire-fighting apparatus was given instruction in first aid to the injured.

The students tested their endurance, while wearing the fire-fighting helmets, by climbing up Castle Rock, using only the artificial air produced by the apparatus. The work with the helmets concluded by having the students in squads of six stay a full hour in the School of Mines' tunnel in an atmosphere fouled with obnoxious gases.

Mineral Resources of Prince William Sound

Copper and gold prospects in the vicinity of Prince William sound, Alaska, may make that region an important producer of those metals. Two copper mines and one gold mine are already in active operation there and a number of other properties have been developed, some of which have made shipments of copper ore. The mineral resources of the region have been examined[1] by U. S. Grant and D. F. Higgins, geologists for the U. S. Geological Survey.

Valdez and Cordova are the two most important settlements in this region. From Valdez three lines of railway have been projected to the copper country, but only a few miles of track have been laid. From Cordova, the Copper River & Northwestern Railway has built about 130 miles of line eastward and northward across the Copper River delta, passing Alaganik, near which is McKinley lake, where there are several gold prospects.

Four smaller towns, a few Indian villages, and a number of mining camps complete the census of settlements about the sound.

Copper is the most important metal found in the district. It was first discovered in 1897, and the prospect first located was developed into the Ellamar now one of the two producing mines. The second mine, the Bonanza, was located in the same year, and both have been worked commercially since 1900. In 1908, the latest year for which production is given, 1,324,963 lb. of copper, valued at $174,895, were exported. These figures, however, represent less than half the amount and value of the metal extracted in the previous year. The annual copper production of Prince William sound has since much increased.

The copper usually occurs as chalcopyrite, mixed with pyrrhotite and pyrite. The investigations made by Grant and Higgins indicate that the ore is of deep-seated origin. Most of it carries gold, ranging in amount from 25c. to $4.80 per ton; the average is probably about $1 a ton. Ores yielding 4 per cent. or more of copper can probably be mined profitably, and less valuable copper ores may be extracted commercially if the amount of gold present is sufficient to make up the deficiency in copper. The ore already shipped has carried from 5 to 7 per cent. of copper.

At present, the Cliff mine, near Valdez, is the only gold-producing mine, but work has been done on a score or more of gold prospects. The ore at the Cliff mine is rich, and there seems to be good reason to believe that some of the other prospects may prove to be of commercial importance.

Topographically the sound and the adjacent Chugach mountains are in a region deeply dissected by water and ice erosion and invaded by the sea. As a consequence the border of the sound is fringed with long fiords and deep valleys, many of which are partly filled with glaciers.

[1] *Bull.* 443, U. S. Geol. Surv., Washington, D. C.

Fire at Richmond Oil Refinery, California

The Standard Oil Company has suffered a second heavy loss within a year by fire at the Richmond, Cal., refinery. Less than a year ago a large storage tank of crude oil burned at a loss of $50,000. On Feb. 7, three buildings known as the old acid refineries and the two buildings comprising the new acid plant were destroyed by fire resulting from an explosion, supposed to have been caused by sparks from the stacks of a furnace building. The actual amount of the loss is not stated; it will likely reach a half million of dollars, if not more. There was no loss of life, but four men fighting the fire were injured. The economic arrangement and construction of the works, and the Standard's efficient organization of fire-fighting brigades, saved the destruction of the entire plant. Although the acid refineries are situated in the center of the great group of buildings, they occupied such a position as to permit the confining of the fire to those structures.

The discovery of gold by [illegible]roaders in a number of sandhills at the western flank of the Eifel mountains has created quite a stir in Rhenish-Prussian mining circles. Five companies have already been formed to explore the gold-bearing ground. Whether it will pay remains to be seen. The ground is not rich, the content of one cubic meter (35 cu.ft.) only containing from ¼ to 3 grams in gold.

Details of Practical Mining

This department is designed to treat in a brief way of details of everyday practice. Many readers are doing interesting things in mining and milling that other readers like to know about. The thought that there is nothing new in them should not be a deterrent of telling about them. Something that is an old story in one district may be quite unknown in another. Our draftsmen can develop any kind of a pencil sketch that is intelligible. A blueprint answers all the purposes of the engraver. Contributions are solicited.

Notes of Interest to Prospectors and Operators of Small as well as Large Mines Things that have to be done in Everyday Mining

Dewatering Slime Samples

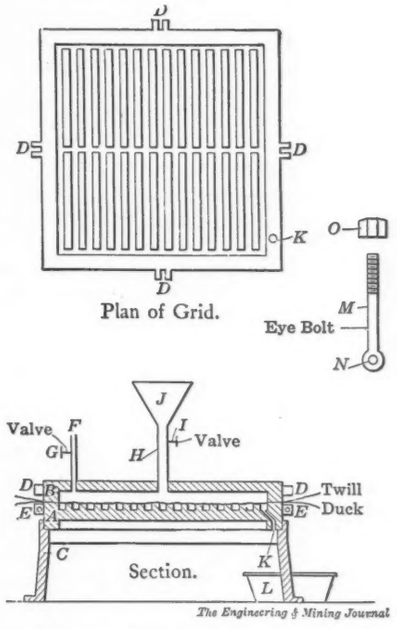
By Clarence C. Semple

At a large cyanide plant many samples of slime are taken and sent to the assay office each day. The slime is mixed with a great quantity of water or solution, part of which may be removed by decanting, if the slime settles readily, but there is danger in decanting the last of the water as some of the finest slime may flow out. The greater the amount of water remaining with the slime, the longer it will take to dry the sample before it can be assayed. In the assay office of the Homestake mine, South Dakota, a small filter-press is used to remove the water from slime samples.

The filter consists of a cast-iron filter plate or grid *A* about 18 or 24 in. square. The upper surface of the grid within the rim is channeled. The channels, as shown in the sketch, are drawn upon an exaggerated scale that they may show more clearly; actually the channels are about ¼ or 3-16 in. wide and not quite high enough to be even with the upper surface of the rim of the grid. At one side of the grid are one or two passages *K*. There is a lug *E* at the center of each side of the grid, in which the eye-bolt *M* is held by a small bolt or pin passing through the hole in the lug and eye of the eye-bolt.

The grid is supported upon an iron stand *C*. The cover plate *B* is the same size as the grid, and is a simple rimmed casting with a lug *D* at the center of each side, corresponding with those of the grid. In the center of the cover plate a hole is bored and tapped for a 1- or a 1½-in. pipe *H*, which is about 12 in. long, provided with a valve *I* and terminating in a large sheet-iron funnel *J*. At one side of the plate another hole is tapped for a ½-in. pipe *F*, provided with a valve *G*. This pipe is connected with the air main in the assay office by a piece of hose.

The grid *A* is laid in the frame *C* and over its upper face a piece of 10-oz. duck, a little larger than the grid, is smoothly stretched; upon the duck a piece of twill cloth of the same size is laid. The cover plate is placed over the grid, the four eye-bolts are swung into a vertical position to fit between the lugs of the cover, and the nuts of the eye-bolts are screwed tightly down with a wrench to hold the cover to the grid. The valve *I* is opened and the slime sample, followed by a little wash water, is poured into the funnel. Valve *I* is then closed and *G* opened to admit air under pressure, which drives the water through the filter cloths to flow through the channels and passage *K* into the pan *L*. By adding water at the funnel while the air valve is closed, the slime cake may be thoroughly washed.



Filter Press for Slime Samples

To remove the sample, the air valve is closed, the eye-bolts loosened and turned down, and the cover plate removed. The dewatered slime is then gathered in a roll or scraped from the cloth with a spatula and sent to the drier. The twill cloth is washed and used for the next sample to be dewatered.

A Wooden Filter Press

A fairly satisfactory press may be made of wood. The channels may be cut with a rabbet plane, and the cover plate planed to leave a rim and space for the slime cake. The rim should not be made of strips of wood nailed or screwed to the cover board, for leakage will surely result. The cover is better held to the grid by clamp screws than by lugs and bolts. An air supply can be obtained by using a bicycle pump with a receiver such as is used for the gasolene tank of gasolene assay furnaces. In time a wooden filter press will warp, but for temporary use it is quite satisfactory.

Mine Tailings for Ballast

By Lucius L. Wittich*

While the use of mine tailings as railroad ballast is not new, the method employed by the St. Louis & San Francisco Railroad Company, west of Joplin, Mo., is, I believe, novel. The tailings were introduced into abandoned and dangerous zinc and lead workings directly beneath the railroad right-of-way through four 8-in. drill holes put down from the surface to penetrate the drifts, 140 ft. beneath.

Hopper-shaped excavations were made at the top of each drill hole, the holes having been sunk between the rails of the track about 20 ft. apart. More than 16,000 cu.yd. of mine gravel were used in filling the old drifts, the greatest volume put through a single hole having been in excess of 9000 cu.yd. That the tailings might be equitably distributed and made compact, streams of water from two 2-in. pumps were poured into the hoppers, the water carrying the tailings through the drill holes and spreading them about the drifts. As a precautionary measure, to prevent the tailings spreading over too wide an area, the ground of the old workings, at certain points where it connected with other drifts, was shot down and these barriers acted as walls which stopped the promiscuous distribution of the waste chat, but which were porous enough to permit the big volume of water escaping into other drifts, from which it was pumped again through the pumps that had been stationed in the mine.

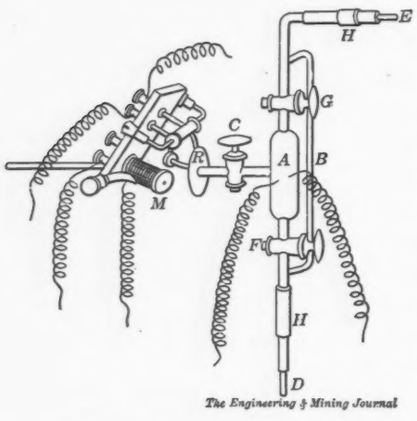
The tailings employed came from the Ruth mine, the drifts of which property caused the trouble. A side track was laid to the tailings heap and flat cars containing 2 cu.yd. each were employed in

*Joplin, Mo.

transporting the gravel to the drill holes. The work occupied 16 days, 125 men being employed, double shift, on the job. The contractors claim the old drifts have been filled in substantially and that there is no possibility of future caving at this point. In recent years several disastrous caves had occurred, endangering traffic on the railroad.

An Explosion Indicator

The explosion indicator, described by N. Teclu (*Zeit. f. prakt. Chem.*, Vol. 82, 237-240), is intended to detect in a convenient place and at a distance from the locality tested, the existence of explosive gases in mines. The figure shows the construction of the instrument which is an explosion pipette *A*, with safety packings of wire gauze at *H H*, and provided with a by-pass *B*. The end *D* is connected by a long composition or tinned-iron pipe with the place the air of which



TECLU EXPLOSION INDICATOR

is to be tested, and the end *E* with a pump, so that a continuous current of air is drawn through. The cocks *F* and *G* are closed (the current still streaming through the by-pass) and the spark from an induction coil passed between the wires. If no explosion occurs, it is because the proportion of combustible gas is either above or below the explosive limit. Should it be above, then on opening for a while the cock *C*, enough air will diffuse in to cause an explosion on sparking again. Should it be below, then if *F* and *G* are opened and sparks passed while the gas is streaming through, flame will be seen in a darkened room with a proportion of combustible gas considerably below that necessary for explosion. If the explosion be made to take place with the cocks *F* and *G* closed and *C* open, and the suspended iron plate *R* closing the side tube, the force of the explosion will drive *R* against the electromagnet *M*, which will hold it, and electrical connections made by this contact may be made to ring a bell at the place tested, and thus give warning.

Inspection Department of the Goldfield Consolidated

In the metal mines of the United States little attention is given to the cause and prevention of accidents. The Calumet & Hecla is an exception; that company maintains a department, the sole duty of which is to investigate all accidents to the end that they may not be repeated; and to inspect the condition of the mine and conditions under which the miners work in order that the safety and health of the miner may be made as secure as possible. Recently this example has been followed by the Goldfield Consolidated Company.

The inspection department is in charge of the fire-fighting equipment. Its members devote the entire eight-hour day in inspecting the mine workings, hoisting engines, hoisting ropes, cages and passages and ladders used by men. The miner who neglects keeping his working place safe is discharged. Records of all accidents are kept, the cause being specified after an investigation. The men are impressed with the importance of attending to minor injuries, especially cuts, in order to avoid septicemic infection.

Since the organization of the department in May, 1910, there have been but two fatal accidents. The records show that the majority of the accidents were due to falls of roof, and falls down ladderways and chutes. Most of the ladderway falls were caused by the miners having one hand employed in carrying tools. The miners are encouraged in every way to report danger, and are commended for their interest even though an investigation shows the report to be not well founded.

A Bushing for Stamp Stems

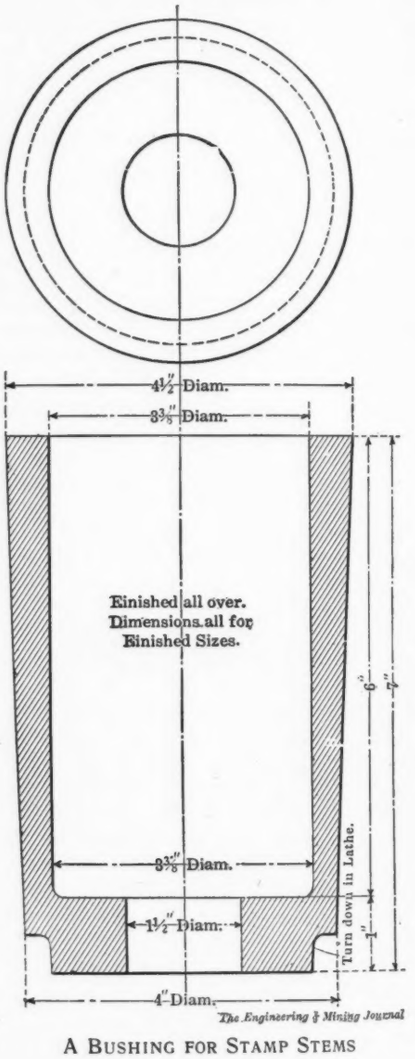
The stems of the stamps in the mills of the North Star Mines Company, at Grass Valley, Cal., are not attached to the boss heads in the usual manner. The stems are without taper at either end, and are held in the boss by a tapered bushing.

The bushing is made of steel, the details of design being shown in the accompanying drawing. The outside of the bushing that fits into the boss is tapered, while the inside cylindrical space for the reception of the stem is of the same diameter throughout. The bushing is made in two pieces, each lacking a sixteenth of an inch of being an entire semi-cylinder, and is grooved for a width of ⅛ in. by a milling saw, from the top almost to the base, in order that the bushing may have a certain amount of spring.

The bushing is placed on the stem, then wrapped with a piece of canvas and dropped into the boss with the stem reaching as near to the bottom of the bushing as possible.

The stems usually break just above the boss head, and when this happens a new boss and shoe are set without taking the stem from the guides. The broken piece of stem is driven out by a drift key, or in case of that means, failing is shot out with dynamite. A shoulder is turned in the base of the bushing so any burring of the metal by the drift key will not project far enough to touch the side of the boss, and so impede the bushing being driven out.

About 20 per cent. of the bushings are broken in driving the broken pieces of



A BUSHING FOR STAMP STEMS

stem out of the boss, but this cost is largely offset by the promptness with which a new boss and shoe can be fitted to a broken stem.

The U. S. gallon is equivalent to 8.3389 lb. water at 62 deg. F., and contains 231 cu.in. According to the *Canadian Engineer*, the Canadian gallon is equal to 10.0172 lb. water and contains a little over 277 cu.in. In speaking of tank sizes in gallons it is therefore important to know which side of the international boundary one is on.

Method of Mining Swedish Iron Ores

H. deRauw describes the modern methods[1] used in some of the iron mines of Sweden, where the ores generally occur in the form of lenses, often of great size, interstratified with Archean gneisses, schists, marbles and other products of metamorphism. The ores themselves have also undergone transformation, which accounts for the presence of the iron as magnetite or hematite. The iron content of the ores range from 50 to 70 per cent., and they are remarkably free from impurities.

The lenses are steeply inclined, between 65 deg. and the vertical; their width ranges commonly between 5 and 25 m., reaching 80 or 100 m. in the celebrated Grängesberg mines. In length they average 100 to 400 m., reaching 1 km., in the mine just mentioned. Such deposits as have an outcrop are mined in open cuts to a depth of 70 m.; below that depth the early practice involved large, open, underhand stopes. As the walls are extremely solid, no filling was formerly considered necessary, in addition to a few pillars left here and there, but as accidents from falling rocks multiplied, a method of filling was adopted many years ago, and is still in use at numerous mines. In order, however, to obviate the extra expense involved by filling, a method of keeping the stopes filled with ore while they are being worked has more recently been inaugurated at some of the most important mines in Sweden. The method as applied to the more common type of deposit, having widths of 5 to 25 m., will be described first.

[1]*Annales des Mines de Belgique*, for 1909.

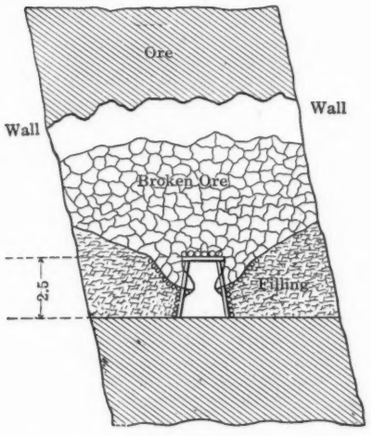


FIG. 1. METHOD OF STARTING STOPE

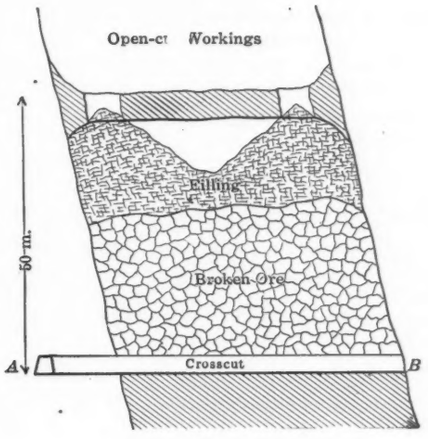


FIG. 2. SECTION *C D* OF FIG. 3

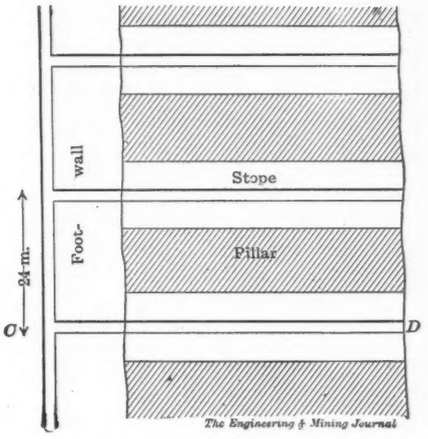


FIG. 3. PLAN OF STOPE

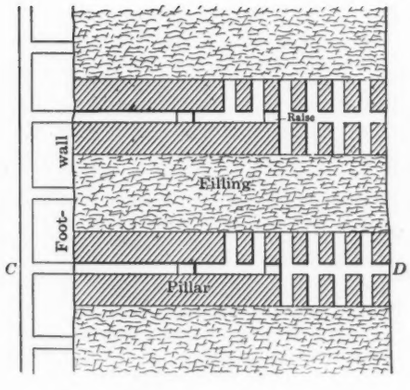


FIG. 4. SECTION *A B* OF FIG. 5

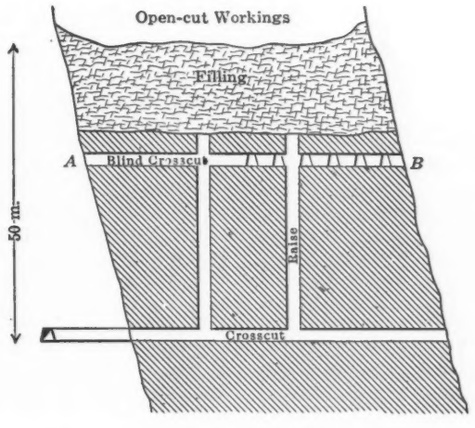


FIG. 5. SECTION *C D* OF FIG. 4

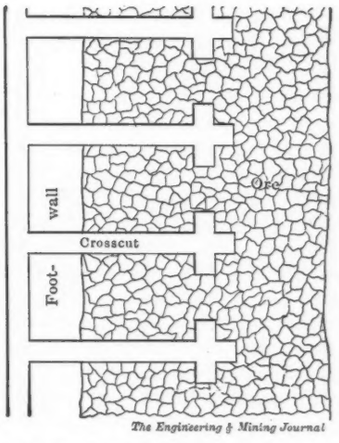


FIG. 6. PLAN OF PERSBERG STOPES

APPLICATION TO NARROW LENSES

A lens is first developed by a drift, which is then widened out to the full width of the orebody, to a hight of 5 m. and to any desired length. Down the middle, or on either side of this wide drift are erected tunnel sets of timber, 20 to 25 cm.sq., covered with heavy lagging. The inside dimensions of the sets are 2 m., width at the bottom, and 2.5 m. hight. Rock masonry is sometimes used for this purpose. Every seven or eight meters, chutes are built into the sides of the timbering; if the timbered drift occupies the middle of the lens, the chutes are placed alternately on one side and the other, but if the drift is close to one wall, the chutes are all placed on the side of the timbering away from the wall, and slight cavities are cut out of the latter, opposite the chutes, to give more room. The empty spaces between the timbering and the walls of the lens are then filled with waste up to a level with the top of the timbering; the waste is piled so as to form a slope toward the chutes, to assist in the flow of the broken ore. The arrangement is shown in Fig. 1.

The deposit is subdivided in the above manner by drifts 50 m. apart vertically. Stoping then proceeds in layers 2.5 to 3m. thick, beginning at the bottom. The broken ore is allowed to accumulate on top of the drift timbers, only enough of it, 30 to 50 per cent., being drawn out through the chutes to maintain an open space on top of the broken ore for the men to work in. Chimneys are built here and there up through the broken ore for the men to climb through and for hoisting drills. As soon as all the ore up to the level above has been broken down in these consecutive slices, it is at once drawn out through the chutes, leaving an empty space that need never be entered again. This is practically the "filled-stope" method of mining.

Application to Thick Lenses

In a thick deposit, as at Grängesberg, where the lens is 100 m. wide, the above method undergoes a change in that the stoping progresses crosswise as at the Homestake mine in South Dakota. A main haulage way is driven in the foot-wall parallel to the vein, and from this crosscuts, spaced 24 m. apart, penetrate clear through the orebody. Stoping over a width of 12 m. then begins above each crosscut, in the manner already described, leaving a pillar of ore 12 m. thick between every two stopes (Fig. 3). In order to facilitate removal of these pillars, it is necessary to fill the stopes with waste. This is accomplished very easily at Grängesberg by cutting two holes up through the floor of the open workings; as the broken ore is drawn off from below, waste is thrown in on top of it, so that when all the ore has been removed, the filling of the stope is complete.

The timbers for this work need to be very heavy and therefore are expensive. A system has accordingly been devised whereby the timbered crosscuts are replaced by crosscuts through the centers of adjacent pillars of ore. By means of a few short drifts at right angles to the pillar crosscuts, the ore broken in the two adjoining stopes is withdrawn through chutes. These crosscuts and drifts in the pillars are later utilized for extracting the ore in the pillars, when the adjacent stopes have been exhausted by the method previously described.

The extraction of the pillar ore proceeds in the following manner: From each crosscut, which extends clear across the orebody in the center of each pillar, two vertical raises, spaced 10 to 15 m. apart, are driven up to within 5 m. of the floor of the open workings at the surface. The upper ends of these two raises are then connected by a crosscut, A-B in Fig. 5, which is then extended from wall to wall of the ore. Short drifts are next cut at short intervals and at right angles to the blind crosscut, reaching out to the waste filling of the previously exhausted stopes on both sides, as shown in Fig. 4.

At the two ends of one or more of these drifts nearest the walls, the roof and sides are attacked from below, with explosives, so as to start a cave. When the first 5-m. block has been disposed of, the vacant space is filled with waste, which has already run in more or less from the adjoining filled stope. Toward the middle of each pillar, the caving process has to be carried on with extra caution, because of the overlying waste filling. The robbing is therefore limited to a hight of about 3.5 m., leaving a layer 1.5 m. thick to support the filling above it. As soon as all possible ore has been extracted from the walls and roof of a few of the short drifts, the roof is caved, allowing the filling to tumble in on top of the broken ore. This operation covers only a limited area each time, so that no danger is involved. The loss of ore by allowing it to mix with the oncoming waste is not serious, since all but about 30 per cent. of it has previously been taken out clean. The caving process goes on back and forth across the ends of the drifts, working toward the blind crosscut and the raises, the broken ore being discharged from time to time down the latter. In the same manner, successive slices 5 m. thick are withdrawn, allowing the filling to follow on downward, until the original level is reached. In a thick deposit like this, it would obviously be impossible to extract all the ore without resorting to some filling method.

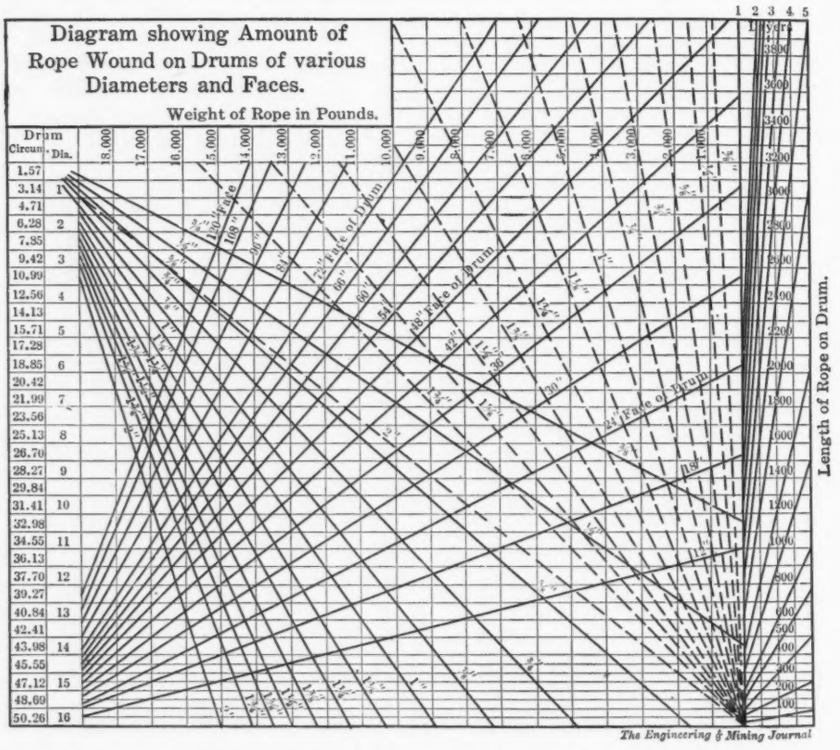
Peculiar conditions at one of the mines at Persberg allow a modification of the above described method to be employed. In this deposit, consisting of magnetite, the ore is minutely fissured and is interspersed with talc, which also forms a slippery coating on the walls. Starting with a haulage way in the foot-wall, it is necessary only to drive a suitable number of crosscuts half way through the deposit, and then short drifts from near the ends of the former (Fig. 6) to afford additional places for chutes. The naturally broken ore can then be drawn out through these, while waste filling is poured in from the surface workings to prevent disastrous caves of the wall rocks, which are similarly seamed and fissured.

Conclusions

To sum up the relative merits of the system *à magazin*, as it is termed, it is safe, while at the same time increasing very greatly the output per man, and consequently, decreasing the cost per ton. It also permits a heavy production at any given time, if necessary. In the less steeply pitching veins, losses of ore sometimes occur by reason of irregularities in the foot-wall, which hold back the broken ore. Then, too, a period of three to 10 years may often elapse while the ore in a given stope is being broken; with a rich ore, the loss of interest on such idle capital might be serious, but it is less so in the case of an iron ore.

Determining the Amount of Rope Wound on a Drum

In determining the amount of rope wound on drums of various diameters and faces, the accompanying chart will be found a quick method of calculation. It is, of course, essential that the circumference and diameter of the drum are known. The chart also assumes that the face of the drum is a known quantity. With these factors at hand, the method of calculation is self-evident. [Note—This is the fifth instalment of a series of short articles and charts prepared by L. F. Mitten, of the Vulcan Iron Works, Wilkes-Barre, Penn.]



Experiments have been made as to the effect of keyways on the strength of shafting, by the engineering experiment station of the University of Illinois. These showed that the ordinary keyway reduces the strength of the shaft about one-sixth. Anyone interested can obtain a copy of the bulletin by writing to W. F. M. Goss, University of Illinois, Urbana, Illinois.

Rail Production in 1910

The production of rails in the United States in 1910, as collected and reported by the American Iron and Steel Association, showed an increase of 20.1 per cent. over that of 1909, and was greater by a few hundred tons than the large output of 1907. The details of the production are given in the following table:

	1909.	1910.	Changes.
Bessemer steel.....	1,767,171	1,917,900	I. 150,729
Open-hearth steel..	1,256,674	1,715,899	I. 459,225
Iron.....	.....	230	I. 230
Total.....	3,023,845	3,634,029	I. 610,184

The total in 1908 was 1,921,015 and in 1907 it was 3,633,654 tons; in 1906 it was 3,977,887 tons, the largest production on record. Of the total production of steel rails last year, 3,460,943 tons were rolled from ingots made by the makers and 172,856 tons were rolled from purchased ingots or blooms, crop ends, seconds, or renewed or rerolled rails.

Of the bessemer-steel rails made last year, 1,892,954 tons were rolled by makers of domestic ingots and 87,946 tons by companies which did not operate bessemer converters. Included in the total by makers of ingots are 68,497 tons of rerolled rails. Almost all the open-hearth rails in 1910 were rolled from basic steel, and virtually all were rolled by producers of open-hearth ingots. Indiana was the largest maker of open-hearth rails in 1910, followed by Pennsylvania, Alabama, Colorado, Ohio, Maryland, New York and California in the order named. The production of iron rails in 1910 was 230 tons, all rolled in Illinois.

The large increase in the use of open-hearth steel is noticeable again, as it was in 1909. Open-hearth rails were 47.2 per cent. of the total in 1910, compared with 41.5 per cent. in 1909; 29.8 in 1908; and 7.5 per cent. in 1907.

The division of rails made in 1910, according to section is as follows:

	Bessemer.	Open-hearth.	Iron.	Total.
Under 45 lb..	190,455	31,977	230	222,662
45 to 85 lb.....	861,591	424,381	...	1,285,972
Over 85 lb....	865,854	1,259,541	...	2,125,395
Total.....	1,917,900	1,715,899	230	3,634,029

The increase in weight of rails is a continuing tendency, as shown by the figures above. Last year 58.5 per cent. of the rails rolled were over 85-lb. sections, a large proportion of them being 90-lb. and 100-lb.; 35.4 per cent. were between 45-lb. and 85-lb.; and only 6.1 per cent. under 45-lb. Street and trolley rails are included in these totals. By far the larger part of the heavier sections were of open-hearth steel.

Included in the steel rails rolled in 1910 are 200,621 tons of alloyed steel rails, as follows: Titanium rails, 195,408 tons; electric rails, 4210; ferro-titanium rails, 532; manganese rails, 390; and nickel, chrome and vanadium steel rails, 81 tons. Of the total 174,822 tons were rolled from bessemer steel and 25,799 tons from open-hearth steel. In 1909 the production of alloyed steel rails was 50,724 tons.

British Mining Investments in Mexico

By Alfred James*

In spite of the sound and profitable nature of investments in such great and well managed enterprises as the Esperanza, Dos Estrellas, El Oro and Santa Gertrudis mines, one is forcibly impressed by the fact that the average British investor is apt to be misled by the enthusiasm of promoters into interesting himself in outside enterprises. By "outside" I mean enterprises either away from a well known mining camp, or "extensions" or "deep leads" of some well known vein. In other words, he is prone to gamble in uncertain futures instead of investing in certainties. And thus all over Mexico one is faced with British mining investments, the total history of which is made up of inexpert floundering with insufficient capital and continuous reconstruction, usually on the plea of unsatisfactory ore-treatment equipment. These reconstructions in some cases have been going on for 20 or even 30 years; the shareholders have never received a penny from the mines and probably never will under present conditions, the money raised each time being spent as hopelessly as that previously put up.

In this article I refer only to gold and silver mines, and therefore omit reference to such paying investments as the famous Mazapil copper and lead mines.

Judgment Necessary in the Selection of Experts

Let us take one or two recent examples. An English group not long since held a meeting at which they asked shareholders to reconstruct on the plea that an expert had been sent out and on his advice a plant had been erected, not one single item of which appears ever to have been really successful for the purpose intended. One naturally asks who was responsible for the choice of the expert and what were his qualifications. Again, a much reconstructed company put up an equipment composed almost entirely of patented methods without in any way getting the experience or assistance of the patent owners, with most lamentable results; their agitators would not agitate, nor would their filters filter; they therefore came to the shareholders for more money to enable them to try their practised hand on something else.

*Consulting engineer, 2 Broad street place, London, E. C.

Dividend Payers Employ High-class Men

These instances might be multiplied by recounting the experience of almost every outside company which has progressed so far as to have a treatment plant, and the question naturally arises as to how it is that dividend-paying mines manage to escape these contretemps. There appears only one possible reply to this and that is that the men in charge of dividend-paying concerns know they cannot gamble with their plants and are, therefore, sufficiently cautious to pay for, and thus procure, the best advice obtainable. Thus, for example, the El Oro, Esperanza and Santa Gertrudis have highly expert engineering staffs, able to design the equipment needed, and other great mines, such as the Palmilla, La Blanca and the Santa Gertrudis (prior to its present staff) have entrusted the design and erection of their equipments to such experts as Girault (of the San Raphael), Barker & Empson, and Macdonald. But the Santa Gertrudis, even with its present staff, is not content to rely on its own skill, but has called in the services also of one of the best known firms of the day, and has done such original investigation work as will not only prove of the highest value to itself, but of great benefit to the industry generally. Outside companies, on the contrary, are usually content to have some clever inexpert design their equipments from makers' catalogs and inventors' pamphlets, with the invariable lamentable results above shown.

Cost of Equipment Indicative of Character

There is one golden method by which an investor can at once verify the prospects of an outside enterprise, and that is by regarding the amount allowed for equipment. It is now admitted practically universally by the great mining managers of Mexico that 200-ton treatment plant for silver-gold ore costs at least £50,000. This is a figure for a simple silver-gold ore without especial difficulties, and includes breakers, battery, concentration tables, tube mills, agitators, filter and extractor house. The general tendency is considerably to exceed this figure—thus the latest plant; the La Blanca, at Pachuca, will cost £80,000, but will probably put through more than the 200 tons a day stipulated. If then, the outside company proposes to erect an efficient uptodate plant, which shall be able to treat low-grade ores for a profit, and of the above capacity, for a sum of £5000, £10,000 or £15,000, it is fair to assume in the absence of exceptional circumstances either that sufficient responsible financial interests do not indorse the proposition or that there is something unprovided for in the estimates, and the investor may well be wary

and take other advice before committing himself.

EXPLORATION COMPANY A CRITERION

Probably the best thing the owners of outside mines can do for themselves is at once to sell their shares and invest in some first-class share, such as the Santa Gertrudis, but as sentiment and optimism will probably interfere with such a wholesale transference of interests, they will be well advised to consult some mining engineer of local experience already connected with some dividend-paying concern and be guided by his advice. Probably the absolute best source of information, if available, would be the Exploration Company, of England and Mexico, which is the most vigorously managed exploration enterprise I have ever come across. The amount of reliable information collected by its own experts must be enormous, the management is skilled and untiring, and, personally, I cannot but think it would be for the benefit of the British investor to consult this concern if possible as to every Mexican enterprise in which he may be invited to interest himself. It is almost certain the Exploration Company has already examined it. Certainly they had been before me in almost every enterprise brought to my notice by "outside" men in Mexico, and my faith in the accuracy of the information at the disposal of the Exploration Company is unshaken.

Let the investor then consider carefully the two suggestions noted above and when reading the grouping of the companies below, let him remember that an occasional class *B* company may have already taken expert advice and such steps as may result in its being placed equal to the investments in class *A*. Bearing the above remarks in mind I class the investments as follows: Class *A*, investments in well known mines in famous mining districts; class *B*, investments in "extensions" and "deep leads" of the above, and in "outside" districts. Considering the first class generally, investors in well known mines, especially the high-priced ones, are getting a good return for their money. Of course, it must be remembered that the future of Mexican mines cannot be forecasted so definitely as that of the enterprises on the Rand, but this may not be altogether a drawback and, on the other hand, the ore is of higher grade.

NO SPECIFIC INFORMATION

When this article was first written (in June last), I committed myself to certain definite statements regarding values of certain investments and, indeed, ventured to make certain suggestions, which Fate has since been so good as to verify. The various prominent mines under British control in Mexico were dealt with *seriatim* and a note given as to their prospects, or at least as to their classification, but in view of the possibility that the publication of the views of one individual might, perhaps, affect the market value of a mine—and this is not the object of this paper—I have preferred to omit this portion of my remarks and to confine myself to adding that while the prominent class *A* mines are yielding good returns, as indicated in the preceding paragraph, and the class *B* mines are not unusually in the throes of reconstruction, doubtless the adoption by the latter of the methods which have proved so successful in the exploitation the class *A* group would result in the transfer of such mines into the class of dividend-paying investments, but it is hopeless to expect so desirable a consummation to result from the only too frequent policy of "drift." If the investor would only look around and insist on control or management being in the hands of the groups already making money for their shareholders or, failing this, if he would change his investment into a property thus controlled, he would probably save himself much further loss.

Arizona's New Constitution

SPECIAL CORRESPONDENCE

The new State of Arizona has adopted a constitution which is noteworthy in several ways. In the first place it is the shortest constitution ever adopted excepting only that of Vermont. Also, it is the most progressive constitution ever adopted by a State on admission and in some ways the most progressive yet known. Dissenters from its provisions called it radical. Unlike the constitution of Oklahoma, which was loaded with legislative matter, it concerns itself only with the fundamental principles of government, and in that respect is a model. A few of the most important provisions are the following:

The constitution may be amended by vote of the people at any time upon the initiative of 15 per cent. of the voters, or a majority of the legislature, and is thus flexible. Any legislation can be initiated by 15 per cent. of the voters and laws passed by the legislature can be referred by 5 per cent. of the votes.

All elective officers can be recalled by 25 per cent. of the voters. This includes the nonpartisan judiciary. It was this provision on which the opposition harped, and it this provision that the President is supposed to dislike.

Direct primaries are provided for, and advisory primaries for United States senators. Lobbying is prohibited and corrupt-practice laws must be passed.

Anti-child labor, employer's liability, workingmen's compulsory compensation, abolition of fee system, and a mine inspector with powers are provided for.

Physical valuation of railroads as a basis for rate regulation is the most important commercial regulation.

A corporation commission with wide powers over companies offering stock for sale, and a provision to rigidly regulate corporations, if rightly administered, is aimed to make Arizona a place of honest corporate business. This may curtail the business of some speculative persons, but cannot fail to be for the public good, and especially for the good of legitimate mining.

The canvass preceding the ratification election was interesting and sometimes exciting. The principal argument against its adoption being that the President would not approve it. In fact, the use of the President's name in this canvass was much abused by officeholders under him.

It is generally believed in Arizona that Congress will accept the constitution and that the President will approve the concerted action of a quarter million of people even though a few sections of it may not appeal to him.

High Speed Steels

The accompanying table, showing the composition of well known high-speed steels, is furnished by C. W. Leavitt & Co.

COMPOSITION OF HIGH SPEED STEELS.

	Cr.	W.	C.	Mn.	Si.
Bedel & Co., Paris	8.10	22.80	0.90	0.27	0.20
Austrian Phoenix	3.70	20.70	0.67	0.14	0.15
English Novo	2.95	18.85	0.76	0.42	0.33
Austrian high-speed	7.19	24.50	0.93	0.23	0.24
Universal	6.50	23.50	0.60	0.14	0.42
Kysar	1.22	18.77	0.87	0.27	0.11
Armstrong	3.40	12.44	0.78	0.49	0.44
German	3.70	30.20	0.60	0.24	0.23

For the production of steel of this nature, they recommend a high-grade ferrotungsten, containing from 80 to 85 per cent. tungsten and about 15 per cent. iron. The production of the highest grade of steel is thus obtained with a minimum consumption of tungsten.

Standard Solutions of Hydrochloric Acid

It is well known to chemists that it is impossible by boiling either to concentrate or deconcentrate a solution of hydrochloric acid beyond a certain point, as the distillate and residue eventually have a fixed and equivalent composition. Hulett and Bonner (*Journ.* Am. Chem. Soc.) recommend taking advantage of this fact to prepare standard solutions of hydrochloric acid. Distil off about three-quarters of a solution of hydrochloric acid of about sp.gr. 1.10. If the acid is a little stronger than this, there is simply a little more hydrochloric-acid gas to be driven off; if a little weaker, probably some pure water will first distil. The residue then contains exactly 22.24 per cent. of HCl, and from it any required strength of solution can be prepared by dilution.

Western Phosphate Legislation

By Claude T. Rice

An innocent-looking bill, apparently in the interest of certain corporations, will give control under placer location to important Western phosphate deposits.

Under pretense of protecting the honest prospector and the original discoverer of mineral on the public domain, Mr. Mondell, of Wyoming, introduced in the House of Representatives on Jan. 18, H. R. Bill 31,651, entitled, "A Bill Providing for Adjustment of Conflict Between Placer and Lode Locators of Phosphate Lands." This bill is very brief, comprising only nine lines as printed, and is, no doubt, well adapted to being tacked on as a rider to some other bill in the hurry of the closing days of a crowded session. The bill in question reads as follows:

"Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, that in case of any conflict between locators under the placer laws and the mineral-lode laws on locations heretofore made of lands containing valuable deposits of phosphate or phosphate rock, the respective claims of the locators shall be determined as though location of said lands under either of the above laws was valid at the time said locations were made."

The bill on the face of it seems fair and just, but on closer examination it presents serious questions. The bill is manifestly retroactive, and in no way concerns itself with future claims, for it is intended solely to adjudicate questions of past locations. It is, therefore, out-and-out special legislation and suspicious on that account if on no other.

The Question of Placer or Lode Locations

Under the statutes every mineral location is either lode or placer, and it cannot be both. The nearest approach to such a condition is the provision for the placer locator to include the lode within his placer and as this brings the cost of patenting up to that of "lode" patents, the practical result is the same. The question is, therefore, one of fact, whether the phosphate deposits are lodes or placers. Already the matter is in the hands of the courts, and several lode claims of phosphate ground have gone to patent. The placer claims though are held up. Then comes this special bill, aiming at special legislation, that will take these lawsuits out of the hands of the courts, and in order to give a good reason for it the poor prospector is given as the one who is the interested party.

All special legislation is worthy of investigation. When it is in the interest of the poor man it is so unusual that it is worthy of more than passing notice for, forsooth, a champion of the people may be making his entrance into Congress. Accompanying this article are pictures of phosphate deposits in two of the Western phosphate fields that clearly show the nature of the occurrence of these deposits. Evidently it is the placer claimants that are to be benefited by this law. Therefore, it is the present owners of these placer claims of phosphate deposits as yet unpatented that are to reap the benefit of this new law, for no one, not even the greenest tenderfoot, could look upon such deposits as placer deposits.

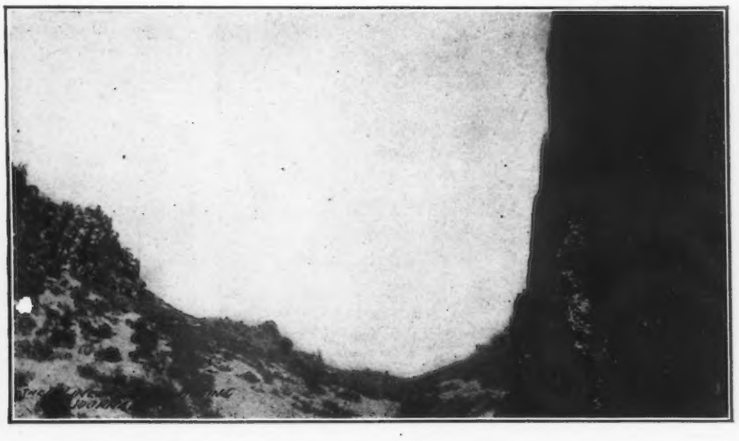
Such an investigation shows that it is two corporations that are to be benefitted, viz., the San Francisco Chemical Company, a subsidiary of the Mountain Copper Company, and the Union Phosphate Company, a subsidiary of the Stauffer Chemical Company.

Shafts Sunk to Mine "Coal"

To understand the conditions truly it is necessary to go back a few years and briefly review the history of these phosphate deposits. They are in general located in the midst of agricultural districts, and as they are quite prominent they soon attracted attention. Owing to their black color the farmers thought that the phosphate bodies were coal deposits and sunk shafts in some cases a hundred feet deep upon these "placer" deposits. But the farmers soon found out their mistake, and the prospecting of the beds was stopped. In 1904 the true nature of the deposits was recognized, and the main occurrences were located for phosphate, and as lode claims. Later the knowledge of the fact that in Florida, where the phosphate deposits are really placer and had been so located, caused the original locators to slap placer locations over their previous lode locations.

It was as original lode locations and later placer locations covering the same ground that the titles to the ground were sold to the corporations in question. Then it appears that the scheme of patenting these deposits as placer deposits came to the fore, for that form of location is much cheaper to patent than is the lode, as these "placer claims" are in general located about 660 ft. wide with their length parallel to the strike of the beds approximating to a nicety lode locations. As the placer locations are of the type called association placers and include 160 acres of ground, since eight names are used in making the locations, they can be patented at one-eighth the cost at which patent to the same ground could

Phosphate Vein, Raymond Canon, Wyoming



Vertical Wall of Phosphate Vein, Raymond Canon

be obtained were it covered by lode locations.

With the many claims that these corporations had bought up the saving of the placer patent over the lode patent was quite important. So apparently the psychology of the transaction was somewhat as follows: These phosphate deposits are situated among a lot of farmers who know little, if anything, of the mining laws. The Land Office has the precedent of the Florida deposits for allowing placer locations to cover phosphates, and precedent is everything in the Land Office. This permits of patenting the land at one-eighth the cost of what it would be if lode locations were used in going to patent. If the patents are issued the company will have the phosphate deposits no matter what they are, for the placer patent includes all unknown lodes. So the company may as well take the chance.

Consequently they, the big corporations, not the poor locators of Mr. Mondell's bill, proceeded to patent placer locations. But unfortunately for the two corporations in question, before their placer patents were to a stage of issuing from the Land Office, the Bradley brothers, connected with the American Agricultural Chemical Company, obtained patents to 24 phosphate claims under the lode form of location.

Deposits Relocated as Lodes

This attracted attention to these phosphate deposits and some mining men went in and relocated the lode claims that the corporations had allowed to lapse, thus renewing the status of the lodes, and by this action they excluded the known lodes from the placer locations, even provided that the placer locations were allowed to proceed to patent. Otherwise the placer patents would have included the phosphate deposits as they were lodes not known at the time of patent, according to law.

As a result, the placer locations have become valueless unless the courts can be made to see these beds of phosphate as placer deposits, a view which does not seem probable. Suits for title are now pending in the Federal courts of three States, while there are many protests pending before the Land Office. In every instance the placer claimants are either the Mountain Copper Company or the Stauffer Chemical Company through their subsidiary companies. In such case the placer claimants have appeared reluctant to go to trial in the Federal courts, but now comes Mr. Mondell with his bill ostensively to protect the original locator, but which really by means of special legislation, takes the cases out of the hands of the courts and gives to the companies in question practical control of the Western phosphate deposits in a manner similar to that by which the control of the hydrocarbon deposits in eastern Utah were, by special legislation, given to the Raven company.

The present mineral laws seem to be ample to cover the proper way in which to obtain phosphate deposits. It is a question of law into which the placer claimants in general walked with their eyes open. The stake is the control of the Western phosphate deposits which, in the future, will become of the utmost importance to the country and its prosperity.

If the companies in question have legally "corralled" the phosphate land, nothing can be done. But surely it is not right for Congress to lay the foundation to an important monopoly by a system of special legislation. It would, therefore, seem well for the generations to come, if Mr. Mondell and his solicitude for the "original locator" of phosphate land were watched rather closely.

Carbon Determination in Iron and Steel

A modification of the usual combustion method for the determination of total carbon in iron or steel is proposed by F. Wüst in *Metallurgie,* June 8, 1910, p. 321. The weighed sample is melted with five times its weight of a mixture consisting of three parts antimony and one part tin. At the melting point of this mixture, about 800 deg. C., the solubility of the carbon in the metal is so much reduced that most of it passes into a more readily oxidizable condition. The metallic mixture is then ignited in a current of oxygen in a combustion tube, and the resulting carbon dioxide is absorbed in caustic soda in the usual manner. With nickel and tungsten steels, the method is more accurate than the Sarnström method, and it is especially applicable to those materials for which the ferric chloride method alone has heretofore been successful.

Phosphate Veins in the Crawford Mountains, Rich County, Utah

Natural Gas within the City Limits of Hamburg

Jena Correspondence

In boring a hole on the territory of the free city of Hamburg, an accumulation of natural gas was struck on Nov. 3, 1910, at a depth of 810 ft. The gas rushed out of the drill hole with such tremendous force that operations had to be abandoned, and it accidentally took fire, the flames shooting up to hights of from 15 to 60 ft. It took the Hamburg fire brigade considerable time to extinguish the fire. The hole was then plugged, but after the lapse of a week the plugging burst and the gas escaped again. As no provision had been made to utilize the gas, it was purposely ignited. The water oozing out of the bore hole contains several per cent. of sodium chloride.

Hindered Settling Classifiers

By Robert H. Richards *

A comparison of free-settling and hindered-settling classifiers demonstrates that the latter make a smaller middlings product and greater quantities of concentrates and tailings.

*Professor of mining engineering and metallurgy, Massachusetts Institute of Technology, Boston, Mass.

The senior class at the Massachusetts Institute of Technology made the test here described, to compare a free-settling with a hindered-settling classifier. Fig. 1 shows the free-settling classifier with feed, distributing grating, 12 regular spigots, a safety spigot and an overflow. The 12 one-gallon bottles for the 12 spigots are arranged in four rows, three bottles in a row, for convenience and compactness. Fig. 2 shows the hindered-settling classifier with the same feed, spigots, bottles and overflow.

Details of the Classifiers

The two classifiers are substantially alike, except in the distinctive feature, which makes one a free-settling classifier; having sorting columns ½ in. in diameter and 2 in. high with no constriction below; the other, a hindered-settling classifier with teeter or hindered-settling chambers above, of 1-in. pipe and constrictions or sorting columns below of ½-in. pipe, 2 in. high. Both are tank classifiers with sloping bottoms, causing the sand to be propelled forward in a cascade along the bottom; both have sides to the tanks sloping downward at 60 deg.; both have a little trough or depression at the bottom with vertical walls in which all the main roughing work is done; both have 12 regular spigots with graded rising currents, one safety spigot for removing any remaining sand, and an overflow for the slime. In both experiments they were fed for 10 min. with quartz and galena; 2.1 mm. — 0 in size, at the rate of 1 kg. per min. The few minor differences between the two classifiers are: the hindered-settling classifier has a slope of 30 deg. at the feed end, the free-settling classifier has a slightly steeper slope. The bottom slope of the hindered-settling classifier is slightly less than that of the other, and its bottom trough is a little shallower and wider. The rated velocities of rising currents are for the ½-in. pipe in both cases. In both cases closed spigots were used, connected by ¾-in. rubber tubing to 1-gal. bottles so that sand only was discharged as no water could come out below.

Adjustment of the Water Currents

To prepare for the runs the first spigot current was made fast enough to lift out all the quartz, allowing galena only to settle; the last was set at 10 mm. per sec. The currents in the intermediate spigots were graded by the eye to make each successive spigot, discharge through the rubber tube, when disconnected from the bottle, less water than the one before it, when the pressure was at 7 lb. in the hydrant. In the free-settling run the waters were not changed at all. Though the sand was run over and over for the students to see the working of the classifier, the products of the last run only were saved for sifting and photographing. At the end when measuring up, it was found that spigots 8, 9, 10 and 11 were receiving no rising currents at all. (See top line of figures, Fig. 3). These cocks may have been disarranged during the run or there may have been a slight amount of sediment in the water to close them up. In the hindered-settling run, which was made after the other, the waters were adjusted by running the sand over and over to get the distribution of sand in the different products as even as possible.

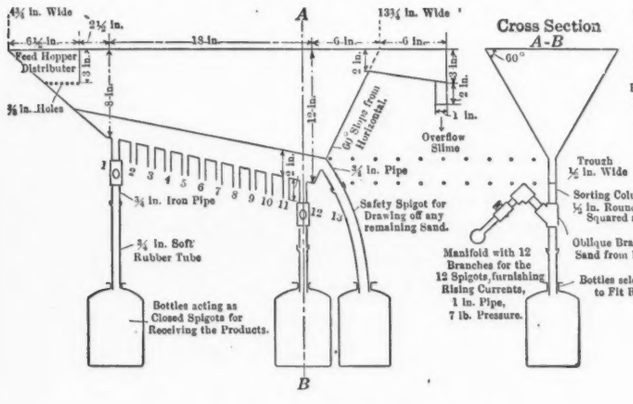

Feed Hopper Distributer
⅜ in. Holes
¾ in. Iron Pipe
¾ in. Soft Rubber Tube
Bottles acting as Closed Spigots for Receiving the Products.
Overflow Slime
¾ in. Pipe
Safety Spigot for Drawing off any remaining Sand.
Cross Section A-B
Trough ½ in. Wide
Sorting Column ½ in. Round Iron Pipe Squared at Top.
Oblique Branch to prevent Sand from Running back.
Bottles selected with Necks to Fit Rubber Tube.
Manifold with 12 Branches for the 12 Spigots, furnishing Rising Currents, 1 in. Pipe, 7 lb. Pressure.

Fig. 1. Free-settling Classifier

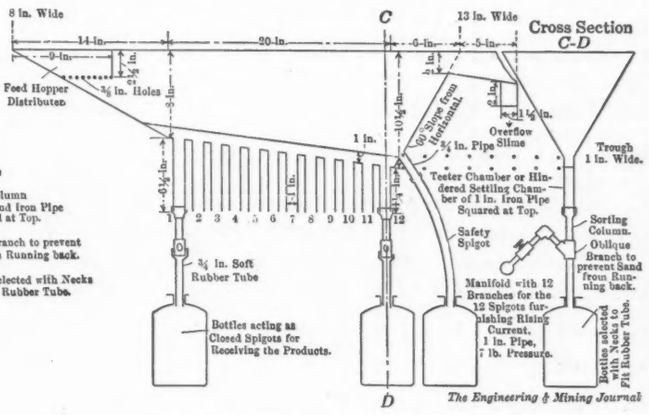

Feed Hopper Distributer
⅜ in. Holes
¾ in. Soft Rubber Tube
Bottles acting as Closed Spigots for Receiving the Products.
¾ in. Pipe Slime
Teeter Chamber or Hindered Settling Chamber of 1 in. Iron Pipe Squared at Top.
Safety Spigot
Cross Section C-D
Trough 1 in. Wide.
Sorting Column.
Oblique Branch to prevent Sand from Running back.
Bottles selected with Necks to Fit Rubber Tube.
Manifold with 12 Branches for the 12 Spigots furnishing Rising Current, 1 in. Pipe, 7 lb. Pressure.
The Engineering & Mining Journal

Fig. 2. Hindered-settling Classifier

Sizing and Estimating the Products

After the free-settling run was finished, the products were sized on a series of sieves beginning with holes 1.97 mm. in size as the coarsest and 0.088 mm. as the finest. The different sizes were arranged on a board, Fig. 3. The percentage of galena was next estimated by the eye in all the heaps by Mr. Perry who has had experience in estimating by counting grains of galena and quartz. There was no danger of biased opinion in this work, as he did not know for what purpose the estimates were to be used. The estimated percentages of galena are given in the table below the diagram. On this diagram, two dotted lines are drawn: the lower line divides heaps with less than 95 per cent. galena from those with 95 per cent. or more. The upper line divides the heaps with no galena from those with 1 per cent. or more. They therefore divide the heaps into three groups: Tailings, those with quartz and no galena; middlings, those with galena ranging from 1 to 94 per cent., and concentrates, those with galena ranging from 95 to 100 per cent. In like manner Fig. 4 shows the relative size of the heaps, the estimated percentages of galena, and also the two dotted lines dividing the heaps into three groups—concentrates, middlings and tailings.

Conclusions

In studying the heaps and percentages we note: (1) That the first spigot of the hindered-settling classifier which contains the grains that settled against a rising current of 220 mm. per sec. has probably double the galena that is in the first spigot of the free-settling classifier with a rising current of 254 mm. per second.

(2) That the hindered-settling photograph has only 32 heaps in the middling class, while the free-settling has 62 heaps of midlings. Of these 32 heaps there are only 14 that are more than half the dimension of the full-sized heap, while

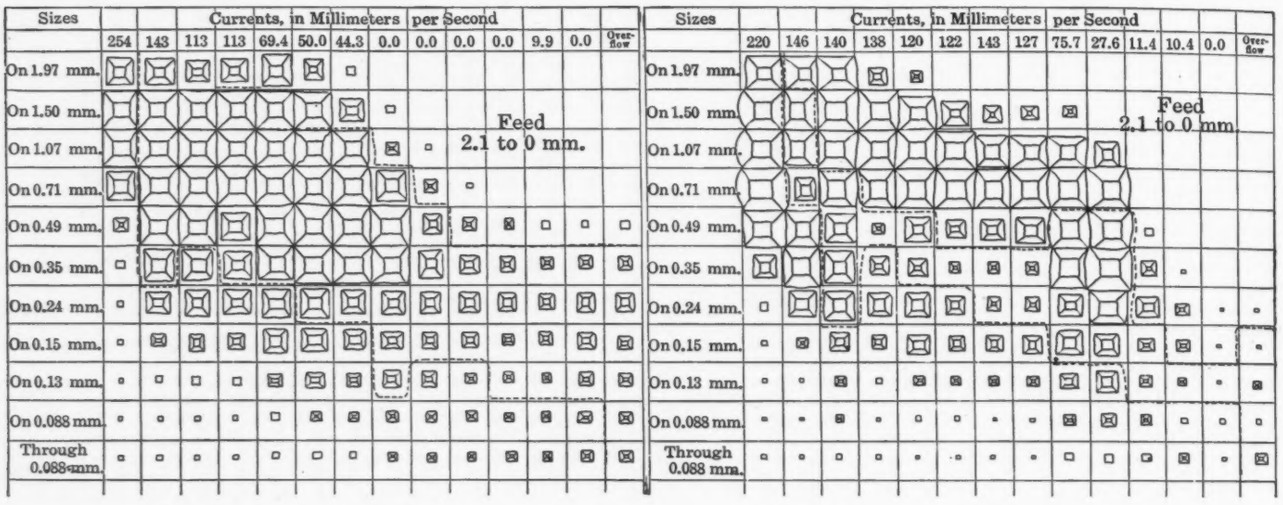
with the free-settling there are 34 heaps that are more than half the dimensions of the full-sized heaps. There is, therefore, in the middlings product of the hindered-settling classifier, somewhere from one-fifth to 1/10 the material in the middlings of the free-settling classifier. It should be noted that there are four large heaps, two in the 75.7 column and two in the 27.6 column that ought to have been in the tailings; these are each estimated however, to have only 5 per cent. of galena, due to imperfect grading of concentrates would be extraordinarily small, and after making those shiftings, the tailings would scarcely contain any galena and the concentrates would scarcely contain any quartz. But for the accident above referred to on column 140 and the error in judgment on columns 75.7 and 22.6, these products would have none of the other minerals in them.

(4) These diagrams and estimates, therefore, indicate that the hindered-settling classifier has won out to a remarkable degree over the free-settling classifier.

(5) It will be seen that in these tests the screen acts as a concentrating machine, finishing the work of the classifier and turning out final products. The fact that with the hindered-settling classifier the finished products, concentrates and tailings, are so much larger than the corresponding products with the free-settling classifier, and that the middlings products are much smaller, is a strong point in favor of the former.

New Hydroelectric Plant in Oaxaca

The Compañia Minera de Natividad y Anexas, in the Sierra Juarez district of Oaxaca, has recently purchased from the Compañia Ingeniera, Importadora y Contratista, S. A., a hydroelectric plant having a capacity of 1000 h.p., the mine having outgrown its old equipment. A canal is being built to take the water from the tailrace of the old plant. This will give a head of 170 m. at the site of the new plant, so that there is enough water power available to develop 1000 h.p. The new plant will consist of two 500-h.p. Pelton wheels, to each of which a 375-k.v.a. Westinghouse alternating-current generator will be directly connected. The excitation will be done by two 15-kw. machines, either of which has sufficient capacity to excite both generators. The electric power will be taken to the mine and mill, a distance of about two miles, as a 2400-volt three-phase current. The plant should be running in a few months.



FREE = SETTLING CLASSIFIER. HINDERED = SETTLING CLASSIFIER.

Rising Currents in Millimeters per Second

Screen Sizes	254	143	113	113	69.4	50.0	44.3	0.0	0.0	0.0	0.0	9.9	Safety Spigot Overflow
Percent Lead Sulphide in the heaps Estimated by Eye													
On 1.97 mm.	100	40	2	0	0	0	0	-	—	—	—	—	—
On 1.50 mm.	100	50	3	1	0	0	0	0	—	—	—	—	—
On 1.07 mm.	100	60	5	2	2	1	1	0	0	—	—	—	—
On 0.71 mm.	100	75	25	5	5	3	2	2	0	0	—	—	—
On 0.49 mm.	100	85	75	40	7	10	5	3	2	0	0	0	0
On 0.35 mm.	100	90	95	90	25	15	7	10	3	2	2	2	5
On 0.24 mm.	100	98	100	100	100	60	40	15	5	5	4	3	3
On 0.15 mm.	100	100	100	100	100	100	100	85	10	10	15	10	5
On 0.13 mm.	100	100	100	100	100	100	100	90	95	95	85	75	75
On 0.088 mm.	100	100	100	100	100	100	100	95	95	95	95	95	95
Through 0.088 mm.	100	100	100	100	100	100	100	100	100	100	100	100	100

Fig. 3. Comparison of Products Obtained under Free- and Hindered-settling Conditions

Rising Currents in Millimeters per Second in the Constriction ½ inch Tube

Screen Sizes	220	146	140	138	120	122	143	127	75.7	27.6	11.4	Safety Spigot 10.4 Overflow
Percent Lead Sulphide in the heaps Estimated by Eye												
On 1.97 mm.	100	0	0	0	0	—	—	—	—	—	—	—
On 1.50 mm.	100	1	0	0	0	0	0	0	0	—	—	—
On 1.07 mm.	100	1	0	0	0	0	0	0	0	0	—	—
On 0.71 mm.	100	85	1	0	0	0	0	0	0	0	—	—
On 0.49 mm.	100	100	10	25	2	0	0	0	2	3	0	—
On 0.35 mm.	100	100	50	100	30	25	15	10	5	5	0	0
On 0.24 mm.	100	100	85	100	95	95	90	85	20	5	2	0
On 0.15 mm.	100	100	95	100	100	100	100	95	85	75	5	0
On 0.13 mm.	100	100	97	100	100	100	100	98	100	98	85	50
On 0.088 mm.	100	100	100	100	100	100	100	100	100	100	100	100
Through 0.088 mm.	100	100	100	100	100	100	100	100	100	100	100	100

The Engineering & Mining Journal

Fig. 4.

Upward Leaching of Sand

By H. T. Durant *

Aëration of sand is more thoroughly accomplished by alternate upward and downward leaching. Extraction by cyanide is often not complete when effluents no longer show dissolved gold and silver.

*Consulting engineer, St. Ermin's, Westminster, London, S. W.

This article refers only to those conditions of practical metallurgy in which the sand or leachable material is stationary in a vat of some kind, and the solution passes through the sand either upward or downward. Leaching practice as regards gold and silver has been discussed in numberless contributions to the literature of the cyanide process but even now, to meet precisely similar conditions, operators are by no means agreed.

Continuous, and Intermittent Leaching

It is the custom at some cyanide plants to keep the sand covered with solution all the time, and in this way to get a satisfactory residue value by using say from 2½ to even 5 tons of solution per ton of sand treated. A similar extraction can be obtained in the same or less time by using less than 2 tons of solution per ton of sand treated, if the sand is, for aëration purposes, allowed to drain dry as often as possible. Under these latter circumstances there is obviously less pumping, greater value per ton of solution, and less solution to be precipitated.

In the former procedure the only oxygen as such available to aid the cyanide in dissolving the gold or silver is the quantity actually dissolved in the solutions, and that which fills the interstitial spaces in the sand before it receives its first solution; in the latter procedure there is the additional advantage that more than once during treatment the interstitial spaces in the sand (which is moist throughout with cyanide solution) are filled with air—thereby yielding a set of conditions that are generally most favorable for dissolving the metals, which will be subsequently leached out.

A vat 40 ft. in diameter by 8 ft. deep can hold, when filled to a workable hight about 300 tons dry weight of sand in a condition fit for treatment, and occupying an apparent space of about 8000 cu.ft. The actual space occupied by that quantity of sand is only about 3900 cu.ft. and when leached dry the sand still contains 14 per cent. of solution which would actually occupy a space of 1344 cu.ft.—there then remains over 2500 cubic feet of air containing about 40 lb. of oxygen which is sufficient to aid in the solution of about 14,000 ounces of gold, that is to say as much oxygen as under the average circumstances can be dissolved in about 2500 tons of cyanide solution.

Substances Other than Gold and Silver Require Oxygen

In support of the practice of not draining dry during treatment it has been urged that a cyanide solution always does or should contain far more dissolved oxygen than is required by the gold or silver to be dissolved; these latter however, are not always the only substances present which will take up oxygen from the air or from the solutions; material may be present which first must have its own oxygen requirement satisfied and then an additional amount must be supplied to aid the solution of the gold and silver. If such a reducing substance is present in any appreciable quantity it is easily possible for it to require several hundred times as much oxygen as is required to aid the solution of the valuable metals, because the reducing substance is probably present in amount of pounds per ton of sand while the gold, etc., is present in amounts of decimals of an ounce.

An entirely erroneous importance is often attached to the last leachings from a charge of sand. The fact that the quantities of dissolved metal in the last leachings or drainings are low enough, merely shows that under the conditions of working, no further profitable extraction can be obtained—it does not by any means show that the sand or material that has been leached cannot or should not under suitable conditions have been further treated.

Extraction Varies in Different Parts of a Vat

If a vat of sand after treatment be divided into three similar horizontal sections, and be sampled so as to give the residue values separately for the top, central and lower horizontal sections—then under the ordinary leaching conditions, where the whole of the solution is put on at the top and drains from the bottom, it will often be found that the lower section assays from nearly two to three times as much as the top section, the central section being about intermediate; and this in spite of the fact that the last leachings were showing that practically no more metals were being dissolved.

To get the full data for a sand residue one should have, the assay of the total sample, the assay of the separate horizontal sections, the assay of the last leachings, the soluble metals in the total residue sample or in the separate horizontal sections. The value of the last leaching may be satisfactorily low, but the soluble metals may still be too high, in which case there will most probably be a high assay for the lowest horizontal section, causing an extraction correspondingly too low, and a total residue higher than it should be. The assay of the total residue should very closely approximate that of the top section of the residue in the tank.

Causes of High Residue

The principal causes of the high residue in the lower portion of the vat are: Treatment vats too deep, slimy charges and leaching in channels, insufficient air at the bottom of the charge—the necessary oxygen having been used up in the passage of the solution or air down through the charge—a state of affairs which may be remedied by putting some of the solution through the bottom and resorting to the well known method of upward leaching, or by putting through solution from the bottom and subsequently allowing it to leach out downward in the usual way.

By this procedure the cyanide solution containing oxygen is applied to the sand at the bottom of the vat. The deeper the vat the more difficult it is with ordinary downward leaching to supply the necessary oxygen to the sand in the lower portion, and this is the case whether the necessary oxygen is dissolved in the cyanide solution or whether it is obtained by continually leaching dry and thereby letting air follow the leaching solution.

Leaching Material That Tends to Pack

At times for some reason, it may be necessary to leach finely crushed, clean pyritic material which, by downward leaching, would pack, so that long before the treatment is finished the downward passage of the solution (except in perhaps one or two channels) would cease. Under these circumstances I have met with complete success by putting on all solution from the bottom under a static head of about one foot, and then after the solution has risen up through the pyritic material it can leach off downward as usual. This procedure tends to prevent the material packing, in fact always keeps it loose and open—the static head used should always be as low as possible so that the solutions put on should rise

slowly through the pyritic material, thereby avoiding the making of paths of lesser resistance.

The solution thus applied from the bottom of the charge should not be direct from a pump, but should be from a head tank—an arrangement which involves little alteration of the leaching pipe or pump-service system, whatever the solution arrangements may be.

The Construction of Filter Frames

The wooden filter frames which support the filter cloths should be made, for obvious reasons, to occupy the least possible amount of space. The edging of the filter frames can be made the necessary hight to permit proper rope calking when putting in the filter cloths, but the main body of the filter frames can be countersunk so as to occupy a vertical hight of not more than two inches; this is a method of construction that has been well proved. The practice, however, still exists in many plants to construct the filter frames so that they occupy a vertical hight of five inches, thereby absolutely wasting three inches of the hight of the vat, which, in a vat 6 ft. deep amounts to an unnecessary waste of over 4 per cent. of the capacity of the leaching plant. With shallow filter frames and vats above 20 ft. in diameter, it is best, in order to guard against irregularities in the bottom of the vats, to have two or three leaching pipes taking off at different places and joining, coming into one pipe outside; this also tends to prevent channeling in the flow of the solution through the sand.

Crown Reserve Report

Cobalt Correspondence

The annual report of the Crown Reserve shows the production for the last year to have been 3,248,196 oz., and to date 9,048,196 oz. The net value of the production was $1,633,716.66 and the cost per ounce was 11.97c. The total net profit from the mine was $1,368,123.79 for the year, which is equivalent to 77.34 per cent. on the issued capital. The average assay of the high-grade ore was 3611 oz. per ton, and of the low-grade 103½ ounces.

The information regarding the ore reserves is rather vague and no estimate of the number of ounces is given. The report states that "because of the irregularity of silver values and veins in the Cobalt district, and the great element of error in sampling high-grade ores, it is almost impossible to estimate absolutely the ore blocked out. In the Crown Reserve at the 100-ft. level, especially with the lake overhead, it would be only a guess." The fact is that below the 100-ft. level, where the veins enter the Keewatin, they are not regular and the high-grade ore is pockety. It is interesting to note that out of a total production of 9,048,196 oz., 6,840,000 came from one vein. At the meeting it was decided to pay dividends monthly, instead of quarterly, at the rate of 2 per cent. regular and 3 per cent. bonus. The reason for this innovation is not apparent.

The London Mica Market in 1910

According to Baker & Startin, of London, the mica market in 1910 was fairly active and well maintained, the year closing with limited stocks of block mica. Supplies were drawn almost entirely from the presidencies of Calcutta and Madras, although Africa, Canada, South America and Japan each contributed shipments of varying importance. The demand was fairly brisk and prospects are encouraging for 1911.

Calcutta—Shipments of block were somewhat limited, and prices remained at a steady level.

Madras—Owing to local complications, several important sources of supply were closed, resulting in a scarcity, with considerably increased rates for all medium and large sizes.

Demand for splittings, especially the well prepared grades, was very satisfactory, and prices improved all around. Stocks in London are at present very low.

A few fresh supplies of African and Japanese amber mica constitute the chief feature for 1910; the former realized fairly satisfactory prices, but the quality of the latter was poor.

The following figures are compiled from the returns of the London warehouses:

Year.	Arrivals, Cases.	Deliveries, Cases.	Stocks, Dec.31, Cases.
1910	18,995	22,841	5,238
1909	19,929	21,878	10,174
1908	21,309	17,006	12,123

The cases average 112 lb. in weight.

Adobe Furnaces in the Sonora Valley

Special Correspondence

All over northern Mexico, during the many years when mining operations were carried on under conditions which made the Winchester as much a necessity as the pick and drill, there existed from the gulf of California to the eastern border of Chihuahua a number of adobe furnaces which were operated almost exclusively on the rich ores which the Mexicans and Yaquis stole from the mines.

Before the construction of the Nacozari railroad between Douglas, Ariz., and Nacozari, 80 miles south, and before the building of the Southern Pacific system down the west coast of Sonora, only such mines could be profitably operated as produced rich silver and gold ore. Ore carrying as much as 350 oz. per ton was often left on the dump, because it did not pay to market it. Especially is this true of the Sonora valley from Cananea to Arizpe. This valley was part of the main highway from the heart of Mexico and Culiacan to the Spanish settlements in southern Arizona and California. Mining operations flourished along this avenue to the markets in the north.

Ruins of Adobe Furnace and Storehouse

Water flows all the year in the Sonora river from a point about nine miles east of Cananea, where the Cananea water works is situated. About nine miles south of Cananea are the Sante Fé, the Montoya and La Ventura mines, where operations were recently renewed. Twenty years ago they were producers in what is now the Cananea field. With their success sprang up adobe furnaces extending down the river. These furnaces are crude enough, sometimes constructed of adobe only, sometimes of stone and adobe, and occasionally of stone. They could not have been operated at all, except for the fact that the

American workmen and foremen, for fear of extermination, deemed it best to curtail the thefts of ore as much as possible without incurring the concerted enmity of the native population.

The ore from the mines was usually stolen at night. The men about the mines were never far from their guns, and the Mexicans and Yaquis had a wholesome fear of firearms. They knew that it was only the exceptional American who would deliberately shoot a woman, and for this reason the robberies were left largely to the women. The latter would steal up to the dumps in the dark, fill their sacks and then pack it to the furnaces, where the men attended to the extraction of the silver. This plan of operations naturally led to the conduct of a commission business in silver bullion. The furnaces turned over their product to a Mexican jobber, who bought up the output of many furnaces and marketed the bullion in bulk. Americans in many instances did not hesitate to engage in the business of buying this bullion from Mexican dealers.

Another chain of these little furnaces surrounded the Cinco de Mayo mine, 50 miles south of Douglas. This proved a rich field of operations for the native adobe-furnace owners.

The Santa Fé mine has recently installed a new hoist, and this mine will soon be one of the small producers in the Cananea field. It is also probable that the ore on the Montoya dump will be marketed in conjunction with the operations carried on at the Santa Fé. The days for running the adobe furnaces in the neighborhood have passed. American influence has become so strong in the northern part of Sonora that the robbing of the mines will not be tolerated.

Treatment of Tungsten Ores

C. M. Johnson, of Avalon, Penn., in U. S. Pat. 977,096, Nov. 29, 1910, describes a simple treatment for the preparation of tungsten ores (wolframite, hübnerite and ferberite) for use in metallurgical operations, particularly when tungsten steel is to be produced. In the present patent—several others have been granted to Mr. Johnson—the ore is ground to a reasonably fine powder, to which charcoal or carbon in any form is added and mixed, the amount of carbon being determined by experiment. The mixture is then reduced in a furnace in the usual manner. The product contains metallic tungsten combined with some manganese, silica and iron, the latter if wolframite and ferberite have been used. It is to be noted that the quantity of carbon is always under control, and furthermore any iron present in the tungsten ore is reduced and is available for the steel making. The patent has been assigned by the inventor to the Crucible Steel Company of America.

The Quicksilver Industry in Texas

By William B. Phillips*

Since 1899 the total production of quicksilver in the Terlingua district, Brewster county, Tex., has been 44,540 flasks, valued at $1,893,602. The bulk of this metal has been obtained from the limestone area (Edwards limestone) west of Vogel's draw, but of late the active operations have been confined to the bituminous-shale area west of Terlingua creek. The yearly productions of quicksilver in Texas are given in an accompanying table, and are the statistics of the U. S. Geological Survey, with some additions that do not materially affect the totals.

TEXAS QUICKSILVER PRODUCTION.

Year.	Flasks.	Value.
1899	1,000	$42,500
1900	1,800	75,600
1901	2,932	132,438
1902	5,319	239,350
1903	5,029	211,218
1904	5,336	232,116
1905	4,723	172,362
1906	4,761	178,829
1907	3,686	148,387
1908	2,384	122,260
1909	4,188	180,084
1910	3,382	158,958
Total	44,540	$1,893,602

The quicksilver ores in the district are in the upper and lower Cretaceous. The region is characterized by many intrusions of igneous material, chiefly trachytes and andesites, which find their culminating points in Maverick mountain, Saw Mill mountain, Elephant Head, etc. The exact relation of the igneous flows to the deposition of the ores has not been fully worked out, but it is thought that there is a necessary and vital relation between them.

The ores are chiefly cinnabar, but some favored localities, confined almost entirely to the limestones, have yielded much native metal and, in addition, the rare oxychlorides, terlinguaite, montroydite and eglestonite, and one place has yielded the ammonia-bearing material known as kleinite. Taken as a whole, during the last 10 years this district has been characterized by a comparatively high content of metal in the ores, certainly much above the average of any other quicksilver district in the country.

The decrease in production has been due not to the exhaustion of the deposits so much as to the isolation of the district and the difficulty of securing regular supplies of good fuel for the furnaces. As a matter of fact, the district has scarcely been touched. Its distance from rail points along the Southern Pacific Railway from 200 to 250 miles southeast of El Paso, varies from 100 to 130 miles. Wagon freights are still 50c. per 100 lb., both in and out. The labor is almost entirely Mexican, but has been satisfactory. The increasing scarcity of fuel has turned attention toward the use of local coal in gas producers. Within an hour's ride of the chief deposits there is enough fair coal to constitute a fuel supply for many years. It is not the best of coal, but would yield sufficient gas in modern gas producers to do away with the wood, which is now costing about $7 per cord. This coal can be delivered at any mine in the bituminous-shale area for not over $2.50 per ton.

Analyses of this coal, made by the University Mineral Survey, several years ago, gave the results shown in an accompanying table.

ANALYSES OF TEXAS COALS.

	Cub Spring.	Kimble Pits.	Chisos Pen.
Moisture	10.65	4.74	1.16
Volatile matter	50.91	29.84	32.79
Fixed carbon	19.52	49.84	44.53
Ash	18.92	15.58	21.52
	100.00	100.00	100.00
Sulphur	0.86	1.26	3.39
British thermal units.	8,432	11,887	11,958

It is likely that better coal than is here represented could be obtained under cover, as these samples came from near the surface. Coal similar to these samples was used for a long time under the boilers at the Texas Almaden and the Big Bend plants, and coal no better than this is now successfully used in gas producers with great economy.

There is no technical or commercial reason why coal should not be used in quicksilver furnaces in place of wood. Foreign practice has proved this and in this country, Dennis, at Blackbutte, Ore., has shown that it is entirely feasible. With coal at $2.50 per ton and an abundant supply for all ordinary purposes it would seem that there is no necessity for considering the fuel supply as especially troublesome. The wood that is now being used is hauled for 30 miles and not a little has come from the Mexican side of the Rio Grande.

From a long and intimate acquaintance with the district I think that one can depend on large supplies of ore that will average from 1.5 to 2 per cent. of quicksilver. The operations that were under my charge gave an ore that carried a little over 2 per cent. of metal and we purposely graded it down to about that quality. There is little ore elsewhere in this country that averages as well.

*Director, Bureau of Economic Geology and Technology, University of Texas, Austin.

Tin in Bolivia

The largest producer of tin ore in Bolivia is Simon Patiño, who produces from his Salvadora and Unica mines an aggregate of 500 to 1000 tons of *barilla* per month. Aramayo, Francke & Co., Ltd., produce about 400 tons per month. The output of the Llallagua mine is 300 to 400 tons per month. Good progress with the railway construction in Bolivia is being made.

Steam Shovel Work on Mesabi Range

By Albert H. Fay *

Extensive operations on a scale which exceeds the work on the Panama canal. Over 25,000,000 cu. yd. of overburden and 20,000,000 tons of ore moved annually by steam shovels. Openpit mining employs 9000 men, in which the fatality rate is 4.59 per 1000 as compared with 3.32 per 1000 for underground work.

*Mining engineer, 239 West Thirty-ninth street, New York.

It is almost impossible for one not familiar with the Mesabi district, Minn., to realize the magnitude of the stripping operations which have been going on during the last 10 years. The accompanying sketch map shows the areas that have been excavated at a number of the mines in the Hibbing district alone, together with an outline of the waste dumps. The railroad lines shown are given simply to connect each mine with its respective waste dump. No attempt is made to give the exact location of the transportation lines. While the outlines of the dumps and pits are approximate, yet they are close enough to illustrate the magnitude of the work being carried on by the United States Steel Corporation and independent companies.

The Material Handled

The stripping work consists of removing glacial drift which covers the iron ore from 25 to 150 ft. in thickness. There are places where the drift is deeper, but in these the ore is taken out by underground-mining methods. The overburden consists of a few feet of vegetable mold and soil, which usually contains many granite boulders. The remaining portion is composed of sand, gravel and boulders.

In some of the mines, especially the Buffalo & Susquehanna, the sand is loose enough so that it is not necessary to do any blasting—all work being done by steam shovels. In most of the pits there is sufficient clay in the sand to make the entire mass compact and solid. This is broken by heavy charges of black powder.

Blasting the Overburden

Each shovel cuts a slice about 30 ft. deep and 20 to 25 ft. wide. The powder charged is inserted by drilling holes (gophering) in the base of the bank to a depth of 20 ft. The hole is usually driven with a 1-in. steel bar. After the bar is in four or five feet, it is withdrawn and a few sticks of dynamite put in to spring the hole. This enlarges the drill hole to about 10 in. in diameter. The loose dirt is then taken out with a small long-handled shovel. When the hole is the required depth, it is then chambered by placing 15 to 20 sticks of dynamite in the bottom. These holes are spaced about 30 ft. apart and loaded with eight to 15 kegs of black powder and fired usually three or four at a time. It is best for shovel purposes that the ground be not broken too far in advance. Heavy rains settle the dirt, so that it is not so easy to handle, and in winter weather the loose dirt would freeze and have to be broken a second time. Another method of breaking the overburden, and which is usually applied to the ore is to drill vertical holes placed 15 to 20 ft. apart and 20 ft. back from the previous shovel cut. These are 20 to 25 ft. deep, and chambered at the bottom for the powder charge.

Breaking Boulders

The steam shovel dipper will handle boulders up to about 3 ft. in diameter. By the use of chains, larger boulders may be handled by the steam shovel. There are many granite boulders that are from 3 to 12 ft. in diameter. Practically all of these have to be broken by "block-holing." They are drilled by hand, using ⅞-in. steel. Each hole is put in from 12 to 18 in., and a stick of 60 per cent. dynamite inserted and exploded. The driller does this work on contract at 20c. per ft., and he usually drills 12 to 15 ft. per day. Once the boulders are broken, the rock is loaded with steam shovels along with the sand and gravel.

Transportation of Waste Material

Practically all of the overburden has to be transported from two to three miles. The main haulage tracks are on a grade varying from ½ to 2 per cent., and these are kept in excellent condition. The locomotives used are standard gage, weighing from 50 to 60 tons each. There are a few small engines in use in some of the shallower stripping work. At one or two mines, where grades are exceedingly steep, geared locomotives are used. The standard dirt car used by the Oliver Iron Mining Company is of 7-cu.yd. capacity. It will dump on either side and is operated by hand. A few 12-yd. air-dump cars are being introduced in this district.

Shenango Mine, Chisholm, Minn.
Copyright by McKenzie, Duluth.

System is the secret of the success of steam-shovel work. Each man has a certain portion of the work to do, and he does nothing else. There is one crew on the dump, which attends to the unloading of the cars and clearing the track of dirt. Another crew shifts the track. There are usually two or more tracks on the same dump and at the point where these converge on the main line is another crew of men whose duty it is to right the cars and lock them in position for the next load.

The shovel has its regular crew of attendants, who clear the ground and have it ready at all times to move the shovel on a moment's notice. The cars and men are so adjusted that the shovel is working all the time. Good train service is as important in this work as it is upon any trunk system. In fact, steam-shovel work is largely a matter of railroading.

The waste dumps on the Mesabi range are remarkable for their size, many of them covering from 80 to 200 acres or more, and from 25 to 60 ft. high. At Hib-

bing the surrounding country is quite flat, and the waste heaps are of uniform depth. The most economical hight for use for these dumps is not exceeding 50 ft. When they are more than 50 ft. high the dirt has a tendency to collect on the slopes and form shoulders. In time these become quite heavy, and as a result break loose and slide to the bottom. In doing so, not infrequently does the dump break 20 to 30 ft. back of the edge and take the track out with it. Again high dumps settle much more than the lower ones, and it requires a larger amount of work to keep the track in fair condition. When it is necessary to build higher than 40 or 50 ft., a second 30- or 40-ft. dump is placed on top of the first after it has thoroughly settled, as shown in the illustration of the Agnew dump. In a level country the high dumps also require a much steeper grade, which again increases the operating cost.

The cost of stripping varies from 22 to 26c. per cu.yd. for summer work, while for winter work 5 to 6c. per yard may be added.

Capacity of Steam Shovels

The majority of the shovels in use in the district are 70- and 90-ton size, the Bucyrus and Marion shovels being about equally represented. There are a few Atlantic shovels which have been introduced recently.

During the summer months the Oliver Iron Mining Company, in the Hibbing district, alone handled from 1,000,000 to 1,200,000 cu.yd. of dirt per month. This is in addition to the amount of ore which was shipped to the docks. A number of record runs are given in the following figures:

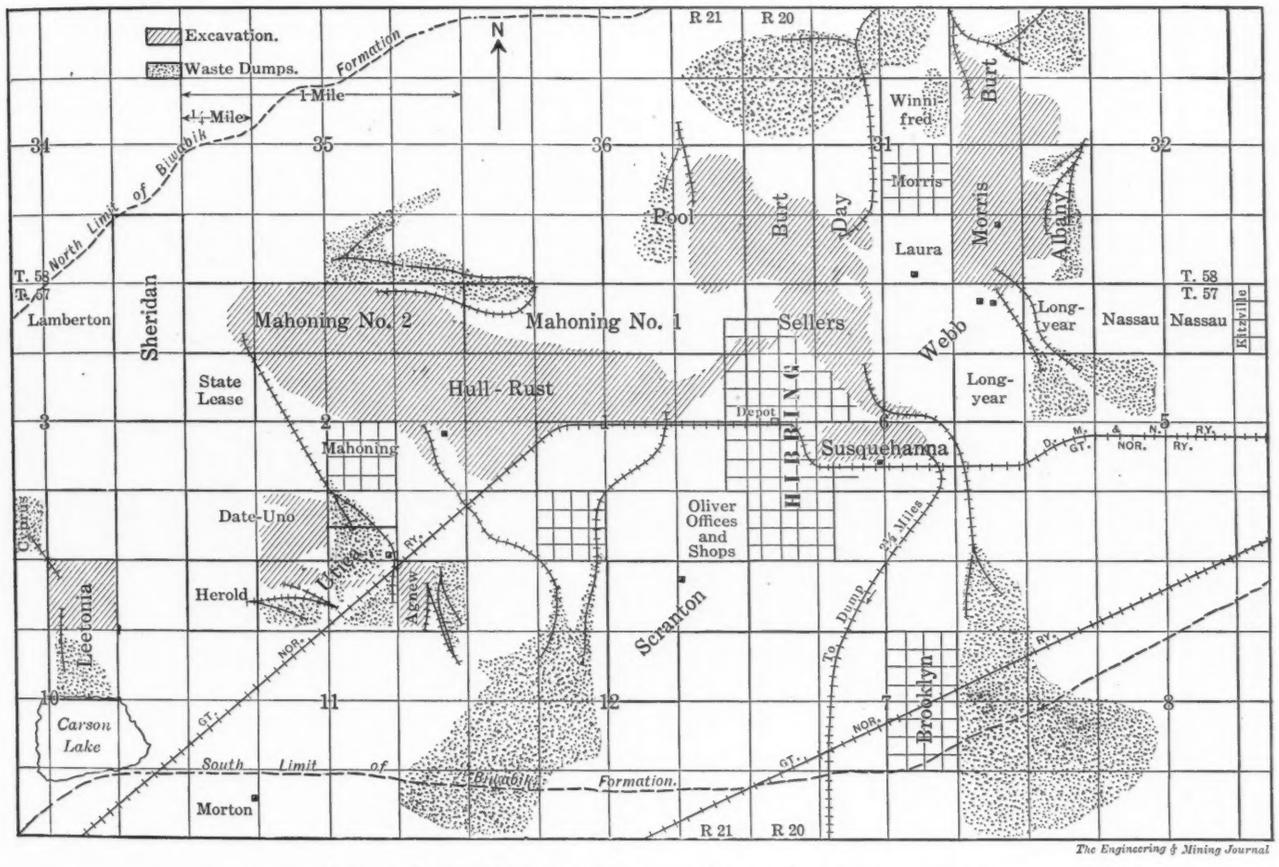
Marion steam shovel No. 1623, 90-ton size, loaded 145 cars with 6023 tons of iron ore during one 10-hr. shift. The Bucyrus, 95-ton shovel No. 1083, loaded 135 cars containing 6292 tons. The Bucyrus shovel was working in heavier ore, which may have accounted for the increased capacity. The Bucyrus 95-ton shovel No. 1079, during the month of June, moved 86,761 cu.yd. of sand and gravel in stripping operations. Three other shovels handled during the month of June 256,382 cu.yd. of the same material.

Monthly Estimates

All of the shovel work, both in ore and in stripping, is cross-sectioned every month. The cross-sections are taken every 40 ft. and plotted to scale and the area of each section determined by the planimeter. There are enough parties in the field, so that this work usually occupies the last three or four days of each month. The cross-sections are taken at the same places each time and plotted on the same sheet of paper with the previous month's work. The work done during any particular month can be readily distinguished by the color with which this particular area is tinted. These estimates are checked with the railroad weights for the ore and with the yardage capacity of the cars handling the dirt removed during the same period.

Almost 9000 men are employed in steam-shovel work alone in St. Louis county, Minn. Of this number 4054 men are on mining work and 4879 are on stripping operations. According to the mine inspector's report for the year ended June 30, 1910, the amount of ore mined underground in this county was 10,577,624 tons, and for the steam-shovel operations 20,667,751 tons of ore. From this it is seen that practically 66 per cent. of the St. Louis county ore shipped from Duluth comes from the steam-shovel operations. During the same period 363,697 railroad ties were used to keep up the transportation lines around the mines. The amount of dirt handled exclusive of the ore was 25,902,178 cubic yard.

Another interesting feature brought out in the mine inspector's report is with reference to the fatal accidents in underground and surface mining. The fatal



The Engineering & Mining Journal

SKETCH MAP OF HIBBING AND VICINITY, MESABI RANGE, MINNESOTA

accidents per thousand for the year referred to for underground mining were 3.32. The fatalities for the open pit mining for the same period were 4.59 per thousand. The latter work more nearly resembles railroading than it does mining, hence the greater percentage of fatalities.

Mesabi District and Panama Canal Compared

The steam-shovel work done in the Mesabi district compares favorably with the work on the Panama canal, where during the same period, according to his last annual report, Colonel Goethals states that during the year 36,500,000 cu. yd. of material were moved. The canal work employs four times as many men, but not all on steam-shovel work. When all of the ore and dirt handled by the mining companies is reduced to a tonnage basis, the open-pit mines of St. Louis county, Minn., handled in one year a little over 58,000,000 tons, while 55,200,000 tons were moved on the canal works. In this comparison I have not included the ore taken from the underground-mining operations in St. Louis county, which amounts to 10,000,000 tons more.

OPERATIONS OF SOME OF THE LARGER MINES ON THE MESABI RANGE FOR THE YEAR ENDED JUNE 30, 1910. (*a*)

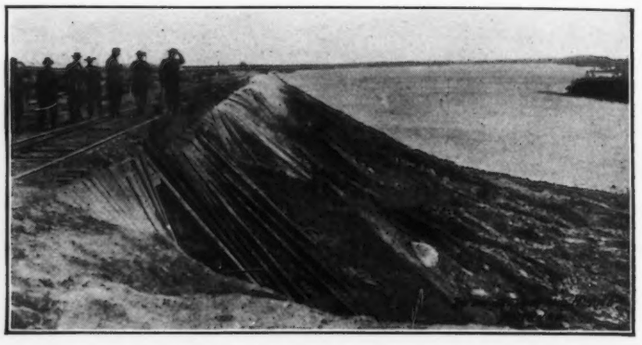
Mine.	Stripping, Cu.Yd.	Ore Shipped, Tons.
Susquehanna	532,857	275,709
Hull-Rust	2,923,460	3,624,414
Mahoning	568,791	1,552,114
Dale-Uno	1,694,203	.....
Sellers	1,356,865	989,503
Rust	1,301,669	.....
Morris	1,487,973	1,973,258
Adams	1,260,742	1,739,996
Fayal	247,629	2,023,053
Genoa	1,064,791	1,572
Leonard	1,716,407	341,030
Shenango	1,431,789	910,870
Hartley	2,240,649	95,371
Grant	1,002,333	.....
Stevenson	82,190	1,378,174

(*a*) From Mine Inspector's *Annual Report.*

STEAM SHOVELS AND LOCOMOTIVES IN ACTUAL MINING WORK ON THE MESABI RANGE.

District.	Oliver Mining Company.		Independent Companies.	
	Steam Shovels.	Locomotives.	Steam Shovels.	Locomotives.
Coleraine	16	31	..	..
Nashwank	..	..	6	6
Hibbing	31	54	15	30
Chisholm	11	22	4	10
Virginia	12	24	7	14
Eveleth	14	24	..	..
Buhl	..	..	4	8
Biwabik	..	..	6	10

Switch Back on the Agnew Double-deck Dump



Water Disposal of Waste Dirt at Coleraine, Minn.

Norman Mine, Virginia, Minn.

Agnew Mine, Hibbing, Minn.

Work at Coleraine

There are 16 shovels at work in this district, about one-half of which are stripping overburden 60 to 80 ft. thick. The disposal of the waste during the summer months is made easy by using a sluicing dump. This dump was originally started on the side of a hill near Trout lake, where a permanent trestle was built at an elevation of about 100 ft. above the lake. As shown in the accompanying photograph, the water pipe was laid just outside of the rail and as the cars are dumped, water is turned on and the waste material is washed into the lake. With this arrangement over 500,000 cu.yd. have been disposed of at a single setting of the track, and there is ample room for two or three times this amount before it is necessary to shift the track.

The advantage of this method is that it requires no track crew to keep up the track, and the dumping space is always open and ready to receive the cars. The pipe is in sections so that the water may be turned on at any point, thus making it unnecessary to waste water. During the winter other dumping grounds will be utilized.

The Canesteo pit covers approximately 80 acres, while the Walker pit is nearly twice as large. Other pits are operated at Marble and Taconite, which send their ore to the Coleraine washing plant.

Work at the Agnew Mine

The accompanying photograph shows the pit and dump of the Agnew mine. This mine has only 40 acres of ground. All of the waste dirt from the mine must be disposed of on this area. The mine itself is on the west side of the 40, and has an overburden of 50 to 60 ft. The

pit is 135 ft. deep, and covers an area of about 15 acres. The waste dump is nearly 150 ft. high and covers the remainder of the 40. In disposing of the waste rock and earth, a 50-ton locomotive can handle only five 7-yd. cars, and in order to reach the top of the dump four switchbacks are necessary. This is a case where steam-shovel work has about reached its limit. To take out the remainder of the ore will require other methods.

Commodore Mine

The Commodore mine, at Virginia, is confined to 40 acres for both the pit and waste dump. A large part of the steam-shovel work being done at this mine is the stripping of caved ground from former workings. It is a case of working over the remnants of a so-called worked-out mine. The work done by the shovel shows that some of the early mining methods which claimed to extract all of the ore were practical failures.

The overburden varies in thickness from one to three shovel cuts, and on account of such limited area heavy grades are necessary. The maximum grade is between 5 and 6 per cent., upon which geared locomotives are opperated. The main entrance to the mine is on a 3 per cent. grade, and the bottom of the pit is reached by a series of switchbacks, as shown in the accompanying halftone. The geared engines will handle five 7-yd. cars of dirt on the steep grade, or two 50-ton cars of ore. On the 3 per cent. grade one of these engines will handle five 50-ton cars. Standard 65-ton locomotives are also used on the 3 per cent. grade. The pit is from 100 to 115 ft. deep, while the waste dump is about 60 ft. high and 900 ft. long.

Shenango Mine

The Shenango is another mine that is confining its stripping operation to 40 acres, although it has other grounds for the disposition of the overburden which is being removed. The waste haul is 2½ miles. The pit is 150 ft. deep and the overburden varies from 50 to 80 ft. The track system of this mine requires sharp curves, with grades as high as 3 per cent. Four locomotives are used in the pit. In addition to the regular locomotives for handling the cars, two Lima geared engines are used as boosters on each train of ore. On account of the sharp curves and steep grades, one 50-ton engine and two Limas can handle only four 50-ton cars from the bottom of the pit. Again, in this mine is an example of the wastefulness of the earlier mining methods. The steam shovel has taken off the overburden and in excavating the old workings it revealed the fact that nearly 40 per cent. of the ore had been left in the mine.

Buffalo & Susquehanna Mine

The deepest stripping operation on the Mesabi range is now being carried on at the Buffalo & Susquehanna mine. The mine has been worked as an underground operation for a number of years and continues so to work. Between 20 and 25 acres of ground are now being stripped, on which the overburden has an average thickness of 147 ft. The amount of dirt to be removed is approximately 8,000,000 cu.yd., all of which will have to be transported a distance of 2½ to 3½ miles. The overburden here consists largely of sand and gravel and no blasting is required, except for breaking an occasional granite boulder.

The Winston-Dear Company, of Minneapolis, has the contract for this work. Two 90-ton Marion and two 70-ton Bucyrus shovels are working at their full capacity. Ten 12-yard air-dump cars make up the train for handling the dirt. Ten 55-ton locomotives operate as many trains.

Fayal Mine

The Fayal pit is 175 ft. deep with an overburden from 50 to 127 ft. deep. The pit is ¾ of a mile long, containing about 100 acres, with railroad grades ranging from 1 to 2½ per cent. on the main haulage line. The water in this mine is disposed of by means of a drift run under the pit at a depth of 75 ft., which is connected with the steam-shovel workings by two raises. This mine has produced approximately 19,000,000 tons of ore, a large part of which has been taken from the open pit.

Bill Relating to Oil and Gas Lands

Washington Correspondence

The House of Representatives has passed and sent to the Senate the administration bill, relating to locators of oil and gas lands. The bill is now before the Senate committee on mines, and it is stated at the committee rooms that the measure is expected to be reported shortly. The bill has a chance of passing although its prospects are injured by the congestion which now exists. There appears to be no serious opposition at present.

The bill as at present before the Senate reads as follows: That in no case shall patent be denied to or for any lands heretofore located or claimed under any mining laws of the United States containing petroleum, mineral oil, or gas, solely because of any transfer or assignment thereof or of any interest or interests therein by the original locator or locators, or any of them, to any qualified persons or person, or to a corporation, prior to discovery of oil or gas therein, but if such claim be in all other respects valid and regular, patent therefor not exceeding 160 acres in any one claim shall issue to the holder or holders thereof, as in other cases: Provided, however, that such lands were not at the time of entry into possession thereof covered by any withdrawal.

Secretary of the Interior Ballinger has recently written a letter strongly commending the bill, in which he says in part:

Because of the conditions peculiar to oil and gas deposits, which commonly lie at great depths in the earth and can be developed only by extended effort and at a high cost, it appears that individuals, in associations of two and upward, have in the past in great numbers of cases initiated placers upon such lands by taking such steps in that behalf as they were able, but minus the all-important elements of discovery and, whenever unable to proceed further for lack of means, they have transferred either to an individual, or to an association of, perhaps, fewer persons, or to a corporation, by whom the discovery and development have been accomplished. This procedure appears to have been the result of what was reasonably considered to be competent legal advice, but the department's interpretation of the mining law, and, which it is constrained to regard as sound, is that an individual transferee, or a corporation as an entity in legal contemplation, may perfect by discovery a placer of no greater area than either could originally locate, namely, 20 acres.

It is my conviction that for the relief of those cases a remedial measure is both needed and deserved, but I think it may be confined to existing cases. It is observed, too, that in its present form the bill is much broader than the withdrawal act of June 25, 1910, which, by the first proviso of the second section, recognizes only such occupancy and diligent exploration as has preceded any order of withdrawal theretofore and thereafter made, while the pending bill would ignore any such withdrawal preceding that act, although ratified and reiterated by the President thereunder.

Dissolution of the Mechernich Company

At a special general meeting on Dec. 22, 1910, the Mechernicher Bergwerks-Aktien-Verein, of Rhenish Prussia, which went into liquidation some time ago, has decided to dissolve and sell its property. Its mines being exhausted, it had to go into the ore-buying business, which proved unprofitable on account of the keen competition and the unstable condition of the lead and silver markets. This is the company which had the highest smokestack in Europe (441 ft. 7 in.) before the one near Freiberg was erected, and also had the most elaborate fume-condensing appliances.

The Maikop Oilfield, South Russia

By P. C. A. Stewart *

A new oilfield being developed chiefly by British capital. Drilling mainly done by hand rigs. Oil is supposed to be both in Cretaceous and Tertiary formations.

*Consulting engineer, S. Pearson & Son, 2a Puente Alvarado, Mexico, D. F.

The history of the Maikop oilfield, of Kuban province, south Russia, began in 1878, when Peter Prokofieff went to Shirvansky and leased some hand-dug wells—there is a report that there is a well dug by hand on the field to over 700 ft., but this is doubtful. He also drilled wells to 240 ft. on plots 290 and 514, and set up a refinery at Shirvansky, but when the excise duty was established in 1888 it is reported that the excise officers caused it to be burned down as being too much trouble for them to watch so small a refinery, which caused the owner to go insane. M. Selitrennikoff, a Batoum lawyer, visited the locality about 1890 and took up leases, and his son sold a small flowing well, cased with small pipe to the Anglo-Maikop Corporation in 1909. This was later enlarged and slightly deepened and was the second of the great gushers. The son still retains an interest. The now famous first gusher was brought in on Sept. 12, 1909, by the Baku-Black Sea Company. Vladimir Winda was appointed by the Kuban government to examine the field in its behalf. He wrote the monograph, "Industie des Naphthes au District du Kuban (Caucasus)," printed by "Nadejda," Morskaya 65, St. Petersburg, 1906; also a pamphlet since the recent oil strike. Messrs. Tchernifsky and Bogdanowitch have each published a geological memoir on the center and western portion of the field in 1909 and 1910. De Hautpick has also published some articles in the London *Mining Journal* in 1910, in which he is very emphatic about the chalk as well as the Tertiaries being petroliferous.

Area of Field 39 Square Mlles

The area described as being petroliferous by the recent government commission is about 59 square versts (39 sq.mi.), but there is a much larger area taken up, by all sorts and conditions of people, as possible petroliferous land, which by some is estimated to cover an area of 660 square miles.

Prospecting licenses are granted on areas of 90 acres (37 decatins) called a *zaifka,* but after a certain period has elapsed the licensee must choose 27 acres (10 decatins) called an *atwad,* on which he intends to sink his well. This must be done within two years. The remainder reverts to the government, and in the now proclaimed petroliferous area is put up at auction; the bids having to be made in sealed envelops which will be opened on a specified day.

The Cossack government levies a royalty of 1 kopeck per pood (4.2c. per bbl.) on the first 2,000,000 poods (250,000 bbl.) obtained, after which it falls to ½ kopeck per pood (2.1c. per bbl.). Few of the various companies are the original leasers, so that there is usually one to two kopecks (4.2 to 8.4c. per bbl.) per pood to pay to intermediaries and in some cases a cash bonus on having the lease transferred. Russian subjects only are allowed to hold leases, so that it is necessary to have them held by some business house of repute in St. Petersburg or Moscow.

Grouping of the Companies

There are in this field three important groups of English capitalists, namely: The Anglo-Maikop Oil Corporation, which is the parent company of the following four companies and possibly more; Black Sea Oil Fields; Anglo-Maikop Oil Fields; Maikop Midland; Maikop Valley. These companies are financially controlled by George Twedie; Sir Boverton Redwood is consulting engineer and F. G. Rappaport, local representative. The other large group is the Maikop Trust. The following are some of its companies: Baku-Black Sea Company; Producers' Company; Maikop Areas (Mr. Henderson, manager); Transportation Company (Tuapse Pipe Lines managed by Mr. Ally). These are financially controlled by Linden Bates; Thompson and Hunter are consulting engineers; Mr. Winter, local representative.

The third group is the London Maikop and Australian Maikop, controlled by Bewick, Moring & Co. Other smaller and apparently independent from these groups are: Spies-Maikop (local organization of Spies, of Grosney); International Maikop, controlled by Garvey & Bergheim; Premier, controlled by Jardine, Matheson & Co.; British Maikop, F. M. Penney, manager. Other interests are the supposed secret combination of the Nobels and Rothchilds; the Shirvansky company; Amavir company, and Europesche-Russki company. The Maximoff company, at Grosney, tells me it has some plots within 460 yd. (600 archines) of the gushers on which it intends drilling. There is said to be 200,000,000 rubles ($100,000,000) of English stock company shares in this field, but how much of this is issued, how much represents actual cash paid, and of the latter how much ever came to the field I can not estimate.

Present Producing Wells

The original gusher was struck by the Baku-Black Sea Company (one of the Maikop Trust group) and came in on Sept. 12, 1909, at 240 ft. and is variously estimated to have produced 220,000 to 360,000 bbl. during the first six days when it was flowing wild, or 37,000 to 60,000 bbl. per day; it caught fire, was capped, but broke out again on Sept. 29, but was again confined. It is cased with 10-in. riveted casing. There was, of course, difficulty in fitting a gate to this, but it was done by putting over the casing a 12-in. gland; to the upper end of this a gate valve was fixed.

The Anglo-Maikop Oil Corporation brought in the second gusher on Feb. 27, 1910, at 214 ft. This well is probably less than 100 yd. from the original gusher. It is cased with 3-in. and 6-in. pipe, but flows a strong stream every 15 min. outside the casing. It is only returned as making 300 bbl. per day at present outside the casing, but as it is running to waste and the company has to pay royalty on this, its production is really considerably underestimated. The specific gravity of the oil is 0.864 (32¼ deg. B.). On the other side of the hill, probably not 300 yd. from the original gusher, the Anglo-Maikop has another well said to be about 210 ft. deep, which is reported to have flowed over the tripod which is over it. It was cased with 4-in. and 3-in. tubing. Another gusher has been brought in on lot 513, by one of the Anglo-Maikop group.

The Spies company brought in a flowing well early in November, 1910; this well is probably a mile or more north of the gushers and produces a heavier oil, 0.924 sp.gr. (21½ deg. B.). These wells are situated about six miles southeast of Neftionya. A comparatively light oil was struck toward the end of November at Hadejensky, which flowed about 5 ft. high above the derrick floor, and heavy oil was struck at in comparatively small quantities at 308 ft., at Hadejensky. Black Sea Oil Fields No. 5, Hadejensky, is about 26 miles northwest of the gusher wells.

Partial analyses of these oils are as follows: From the first big gusher, Sept., 1909, the oil had a specific gravity of 0.864. It contained light benzine, 15.97 per cent., sp.gr. 0.7100; total benzine up to 150 deg. F., 25.11 per cent., sp.gr. 0.7317; illuminating oil, 150 deg. F. to 180 deg. F., 23.84 per cent., sp.gr. 0.8308; residue (*mazut*), 45,000; paraffin, 0.25 per cent. From the second big

gusher, 1910, the oil had a sp.gr. of 0.866, and contained 12.9 per cent. of petroleum spirit, of sp.gr. 0.750; 37.8 per cent. of illuminating oil of sp.gr. 0.821, and 48.5 per cent. of residue.

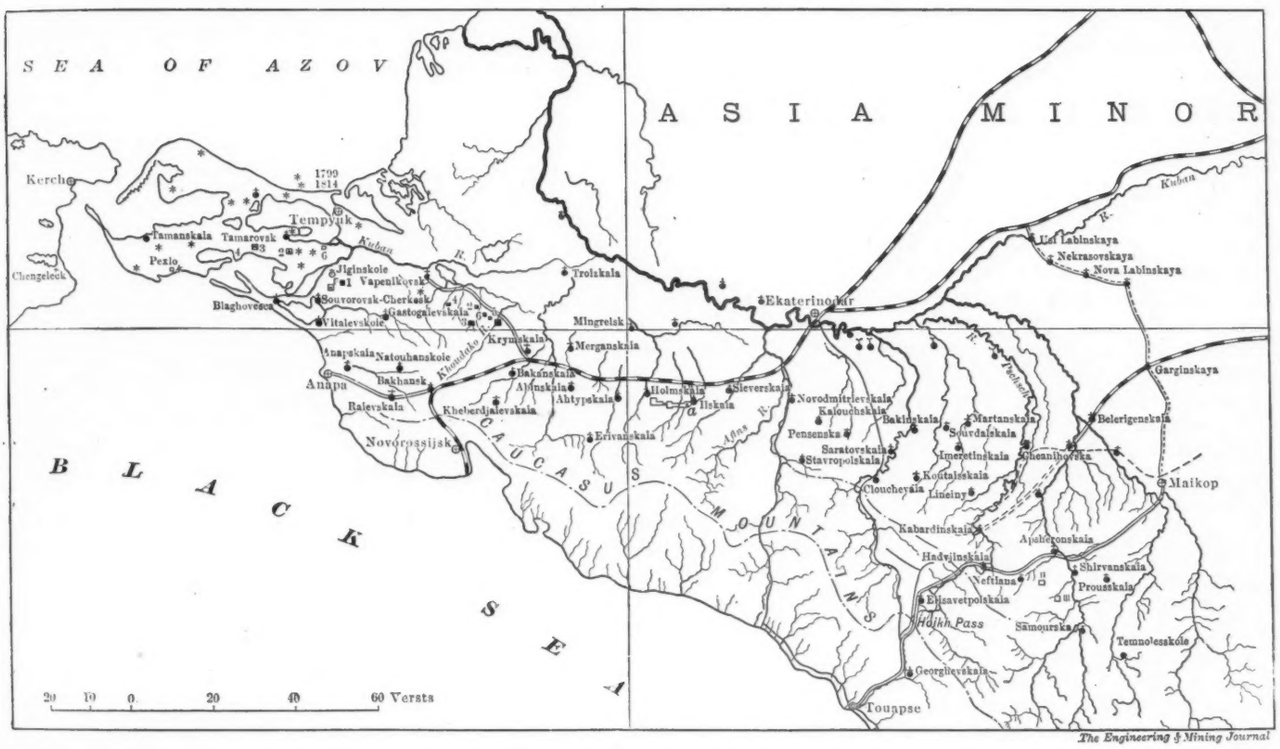
Drilling Methods

So far the producing wells have all been shallow, and have been hand drilled with a species of spring pole, as great difficulties and delays were encountered in bringing in machinery. There are, however, some power rigs now drilling, one of which is down to 1750 ft. (No. 1 of Black Sea Oil Fields, plot 513, of Anglo-Maikop group) and one 530 ft. of the same group, plot 354, being drilled with a Ruston-Proctor crude-oil engine.

The Anglo-Maikop group is adopting the Galician system. The Australian-to 100 sargins, after that increasing 10 rubles ($5) per sargin at every 10 sargins.

Another form of contract provides that the company supply nothing whatsoever, the price in this case being 200 rubles ($100) per sargin ($14.30 per ft.); this great increase in price is, of course, owing to the contractor having to supply the pipe, the increase being as before 10 rubles ($5) per sargin at every 10 sargins.

The Maikop Areas, one of the Trust companies, is probably going to have its wells drilled by an Austro-American contractor with a Star rig. There are also some Russian free-fall rigs in the field. British-Maikop is going to drill its first well by hand, as the estimated depth of oil strata will only be about 40 sargins years ago and found some oil at 525 ft. I believe it was drilled somewhat deeper but is doing nothing just now; No. 5 was begun in June, 1910, with 14-in. casing, only two or three joints of which were put in to shut off the river water; a considerable quantity of heavy oil was struck at 308 ft.; it was cased off and the 12-in. string was carried to 980 ft. The well is now about 1400 ft. deep; no further oil in quantity seems to have been struck. The drilling has been good, 34 ft. per 24 hr. being made when working regularly; no hard rock was encountered; there have been some shutdowns for want of fuel oil and pipe; the rig is Galician. No. 9 is just starting with a Baku rig, and is beginning with 16-in. riveted casing, and a 34-h.p. Ruston-Proctor engine and boiler.



MAP OF MAIKOP OILFIELD

Maikop group was using American cable drillers, but has now turned its American rigs over to a cable-drilling contractor from Grosney, paying the following prices: Supplying steam, rig, derrick and casing to contractor but the latter supplying his own tools and cable, price is 70 rubles per sargin (7 ft.) or $5 per ft. to 100 sargins (700 ft.), with a guarantee from the contractor that he will carry the well to at least that depth; after this the price is to increase 10 rubles per sargin for the next 10 sargins, and at each further 10 sargins there is to be an increase of 10 rubles ($5) per sargin.

Another contract is that the company supply also tools and rope when the price is to be 50 rubles ($25) per sargin (280 ft.), but it has a Columbia machine ordered. No great difficulties with the ground seem to have been encountered in the 1700-ft. well.

Two Water Strata below Surface Water

No. 8 well of the Black Sea Oil Fields has struck two seams of water; the first was charged with carbonic acid and is already recognized in several of the shallow wells round the gusher area; the second at about 460 ft. is also full of gas, partly H_2S, and shows a film of oil (this well is only a few hundred yards from the gusher).

At Hadejensky, the Black Sea Oil Fields have three derricks up, Nos. 4, 5 and 9. No. 4 was drilled about three

The Cossack government now requires both earthen storage and steel tankage. Earthen storage costs about $2500 per 60,000 bbl., smaller sizes being comparatively more expensive. Six thousand barrels seems to be about the usual size for the tankage. It is almost impossible to get delivery under four months, and so several wells have been prevented from drilling by the government engineer on this account. The earthen reservoirs have on two occasions been filled by rain water. The oil flooded over, polluted the streams for 20 to 30 miles, and the Cossack cattle were prevented from drinking.

Transportation

The port is Tuapse, on the Black sea, where there is 18 ft. of water, but it is

impossible to enter in stormy weather. There is also a large submerged rock in the harbor which is being removed; a large harbor is about to be built. The port is about 66 miles from the center of the excitement and connected with it by a good military road, but as it has to rise from sea level to 1500 ft. and down on the other side to 600 ft. there are necessarily some long grades. A railroad is also being pushed ahead from Armavir (on the Vladikafkass railroad) to Tuapse. It will pass through Hadejenskya (western end of the field). Hauling from Tuapse to the present center of the field is contracted for at $15.20 per ton. A road is also in course of construction from Hadejensky (where the railroad will strike this field) to the present gusher region.

Pipe Lines and Refineries

An 8-inch line is laid from the field about 75 miles to Enim station on the Novorussisk-Ekaterinadar railroad. The pumps and tanks are not yet installed. It is estimated that this line should be able to handle 6,000,000 bbl. per year. Two pipe lines have been surveyed by the Maikop Trust group from the field to Tuapse. There is also some talk of a third line to Tuapse, but it is doubted by many whether the field will require more than one line.

A small refinery is about completed at Shirvansky to treat 250 to 350 bbl. per day for local consumption. The oil will be delivered by motor tank wagons. I believe another refinery is in contemplation at Tuapse. There is also a large refinery at Novorussisk.

Oil in Baku is fetching 61c. per bbl. Transportation by tank wagon to Batoum is about 68c. per bbl. The pipe line from Baku to Batoum is only used for refined. Therefore 61c. in Baku plus 68c. for transportation equals $1.29 per bbl. at a Black Sea port (Batoum), which is the price it would have to compete against; it is just possible Grosney oil might be delivered at Novorussisk 10c. per bbl. cheaper.

I have seen the following statement, which was supposed to be authoritative, but I would in no way vouch for its accuracy, which supposes that the gasolene and the residue for fuel will be the important factors, while only about 10 per cent. would be taken out as illuminating oil (about 30 per cent., however, could be used for that if desired), this to be written off against minor expenses. The products would be gasolene, 10 per cent.; illuminating, 10 per cent.; fuel oil, 80 per cent. The cost of producing and putting oil into tanks would be 25c.; cost of conveying to Black sea, 17.2; cost of distilling, 6.5; royalty, 8.4; total, 57.1c. The value of the oil is estimated as 1/10 of a bbl. of gasolene at $5.78 per bbl., or 57c., and 8/10 of a bbl. of fuel oil at 81c. per bbl., or 65c.; the value of 1 bbl. of this oil is therefore $1.22, which less cost of production, $0.57, gives the profit per bbl. as $0.65. The Baku price figured on is not abnormally high; it often goes up to 75c. per bbl. and occasionally to 92c. per barrel.

There were estimated to be about 50 derricks erected on the field in Sept., 1910; probably now there are from 70 to 80, but I doubt if one-fourth of them are yet drilling. Of these about 20 are at Hadejensky and of these only six are drilling. More would be at work if it were not for want of transportation for machinery, and the roads about the field will soon be impassable for transport because of the wet season. In fact most of the wells are being drilled by hand.

Geology

It has usually been said that the oil-bearing beds in this part of Kuban province are Oligocene (Lower Tertiaries). There seems now reason to think that some oil exists in the Cretaceous (chalk) and de Hautpick marks some seepages in even the Lower Cretaceous. The structure would seem to be purely monoclinal in the Tertiaries, the outcrop having a west-northwest to east-southeast strike; the dip in western part of the field is as great as 45 deg., but in eastern only 7 to 12 deg. north, 20 to 30 deg. east. There is much unconformity between the Tertiaries and the underlying chalk. The Tertiaries were apparently laid down in bays along a chalk shore line. The geologist of one of the English groups has discovered many inliers of chalk in the Tertiaries, demonstrating that there were archipelagoes or peninsulas of chalk in this Tertiary sea; he has also shown the nearness of the shore line by finding several beds practically composed of pure chalk pebbles and some in the outcropping "oil-saturated sand series." The general strike of the Upper Cretaceous outcrop would seem to be same as that of the Tertiaries.

There is a recognized foraminiferal bed or zone at the base of the outcropping oil sands; this was thought to mark the bottom of the oil-bearing series, but there is now some doubt about this. That the bed from which these gushers originate does not outcrop immediately to the south southwest (the gushers are only 214 to 240 ft. deep) is pretty certain, there being no oil-soaked sand or seepages in that direction. The question then arises, is this bed a lenticle, which does not come to surface up the dip? It has rather been suggested that this sand was deposited along a cliff line of chalk, or again it is suggested that there has been faulting along the line near where the outcrop would have occurred, thus bringing the chalk up against this sand. Certainly the chalk not so very far from the gusher wells has been strongly impregnated with oil in the past.

How far down the dip and along the strike this gusher lenticle extends remains to be proved; also, if this lenticle dies out in strike, may not other similar ones be found? The striking of a flowing well of a heavier oil by the Spies company in beds which probably outcrop looks as though these outcropping sands may also be commercially productive down the dip. And lastly may it not be hoped that the chalk will also be productive? I am largely indebted to T. G. Madgwick for helping me to see the field so thoroughly.

Vanadium in Sierra County, New Mexico

By Brigham Leatherbee*

The first discovery of vanadium in Sierra county, N. M., was made by Dr. F. M. Endlich in 1884, at which time he was the manager of the Lake Valley mines. The metal occurred in a crystal formation in combination with lead and arsenic, and has since been named endlichite and so classed by Dana and other subsequent authorities.

About 1896 or 1897, William F. Hall, of Hillsboro, discovered the same crystals in the mines about three miles northeast of that town which are now controlled by the Vanadium Queen Mining Company.

In less than a year about 1250 lb. were shipped to the Foote Mineral Company, of Philadelphia, and distributed, as rare mineral specimens, to various public and private collectors throughout Europe and America. Having no known commercial value at that time, both vanadium and molybdenum crystals from these properties were thrown aside, save for such specimens as were noticeable for their beauty, these being sent East as above mentioned.

During the winter of 1909-10, vanadium in commercial quantities was discovered on the old properties of the Southwestern Lead and Coal Company on the east slope of the Caballos mountains. A new company was formed under the title of the Vanadium Mines Company, which took over these mines and is now actively engaged in operating them.

Consul Charles H. Small advises that the new Colombian law in regard to platinum mining provides that such mines shall be adjudicated by the nation and that they may be denounced by anyone on the same terms and conditions as gold and silver mines. All adjudications in favor of foreigners in the districts of Choco and Darien shall be suspended until completion of the work of revising the law. Platinum placers do not require adjudication.

*Hillsboro, N. M.

Coal Mining Department

The Use of Explosives in Coal Mines

No problem connected with coal mining is of greater importance than the proper use and handling of explosives underground. There is a great variety of mining laws in the various countries and States governing the use of explosives, and some of the statutes are wholly inadequate. The recent act or amendment to the mining laws of British Columbia handles the explosives problem in a most effective way. An abstract of the British Columbia rules follow:

No explosive shall be used in any mine except in accordance with the following regulations:

(1) (a) A competent person who shall be appointed for the purpose shall, immediately before the charging of any shothole, examine such hole, shall see the coal is well prepared, the shot properly placed, and that the borehole is well cleaned; he shall examine the character of explosive and shall regulate the quantity of such explosive to be used in such hole, and such hole shall be loaded in accordance with his instructions. He shall examine all places contiguous thereto within a radius of 75 ft., and shall not allow the shot to be fired unless he finds it safe to do so, and a shot shall not be fired except by or under the immediate direction of such competent person appointed for the purpose. In places where safety lamps are required to be used, no shot shall be fired except by means of some form of igniter approved by the chief inspector. After a shot is fired the shotlighter shall examine the place, and the men shall not begin work again in such place until it has been so examined and by him pronounced safe. In any coal face, room or stall, a second hole shall not be loaded until such place shall have been examined by the shotlighter after firing the first shot and by him pronounced safe. In case of a shot missing fire it shall be the duty of the shotlighter to fence off such place and all approaches thereto outside of the danger zone, marking on such fence or fences "Missed-fire shot, keep out," with the date and hour at which such shot missed fire, and such place shall not be entered by any person until it shall have been reëxamined by a competent official after the lapse of time hereinafter specified, and by him pronounced safe and the danger signals removed. In the case of an electric igniter having been used, the time which must elapse between the missing fire of the shot and the time when the place may be reëntered shall be 15 min., and in the case of a shot missing fire when any other means than an electric igniter is used shall be four hours.

(b) Detonators shall be kept under the control of the manager, or some person specially appointed in writing by such manager for the purpose, and may be issued to shot lighters only, and no other person shall take any detonator into a mine. Shotlighters shall keep all detonators so issued to them in a locked case or box of a pattern to be approved by the chief inspector until about to be used, and no other explosives shall be carried in the same case or box with the detonators: Provided, however, the inspector may grant permission in writing that such locked cases on boxes containing detonators may be issued to miners, but a shotlighter shall be the only person in the mine who shall be permitted to carry or use the key for such cases or boxes;

(c) It shall be unlawful for any person to expose any open case or canister containing explosives or any case or box containing detonators within 50 ft. of a naked light on the intake side of the air current, or within 4 ft. in any other direction or to prepare any charge with a naked light on his head.

(2) If the place where the shot is to be fired is dry or dusty, then the shot shall not be fired unless one of the following conditions is observed, that is to say:

(a) Unless the place of firing and all contiguous and accessible places within a radius of 60 ft. are at the time of firing in a wet state from a thorough watering, or other treatment equivalent to watering, in all parts where dust is lodged, whether roof, floor or sides; or

(b) In the case of places in which watering would injure the roof or floor, unless the explosive is so used with water or other contrivance as to prevent it from inflaming gas or dust, or is of such a nature that it cannot inflame gas or dust;

(c) All haulage or other roads that are dry or dusty shall, for a distance of 120 ft. from the place of firing, be watered sufficiently to allay dust.

(3) If inflammable gas issues so freely that it shows a blue cap on the flame of the safety lamp, explosives shall only be used:

(a) Either in those cases of rock drifts, rock work, and sinking of shafts, in which the ventilation is so managed that the return air from the place where the explosive is used passes into the main return air course without passing any place in actual course of working; or

(b) When the persons ordinarily employed in the mine are out of the mine or out of the part of the mine where it is used.

The Important News Of Coal Mining: New Appliances, New Methods, New Fields, Colliery Engineering

Anthracite Shipments for 90 Years

The accompanying table, compiled from the records of the Bureau of Anthracite Statistics, in Philadelphia, gives the commercial shipments of anthracite from the mines since they first began, in 1820. Up to 1905 they are given at five-year intervals; from that date for each year. The figures are in long tons.

ANTHRACITE SHIPMENTS, 90 YEARS.

1820	....	365	1880	....	23,437,242
1825	....	34,893	1885	....	31,623,530
1830	....	174,734	1890	....	36,615,459
1835	....	560,758	1895	....	46,511,477
1840	....	864,379	1900	....	45,107,484
1845	....	2,013,013	1905	....	61,410,201
1850	....	3,358,899	1906	....	55,698,595
1855	....	6,608,567	1907	....	67,109,393
1860	....	8,513,133	1908	....	64,665,014
1865	....	9,652,391	1909	....	61,969,885
1870	....	16,182,191	1910	....	64,905,786
1875	....	19,712,472			

According to the records the total shipments to the close of 1910 were 1,749,396,386 tons. The statements include shipments only, the quantities used in operating the mines and the small local sales made direct from the mines not being included. Allowing for these, the approximate quantity of anthracite mined up to the end of 1910 was 1,942,000,000 tons.

The greatest proportional increase in any five-year period, after a regular trade was established, was 67.7 per cent. from 1865 to 1870. Since 1905 the shipments have been variable, the maximum being reached in 1907, the later years all falling below that point.

Coal Output of China

According to a recent report of Vice-consul W. Roderick Dorsey, Shanghai, China, the output of minerals in China is restricted by the absence of adequate mining regulations, and until rules are promulgated looking toward a more widespread working of the deposit, satisfactory progress cannot be made, although the industry continues to improve.

The mines at Hankow were busy during 1909. The output at the collieries was 520,000 tons, and at the iron mines 307,500 tons of ore. The ore was all consumed by the iron works at Hankow, whose output included 74,000 tons of pig iron, of which 23,700 tons went to Japan, 16,800 tons to Chinese ports and 3800 tons to America. The prosperity is expected to continue, as large orders have been received for railway bridges, etc., and there is enough work in hand to keep the various companies busy for many months. At the Hankow plants, the entire staff, both technical and commercial, remains entirely Chinese. The anthracite mines of the Peking Syndicate, near Weihsien, produced 244,380 tons in 1909.

As an indication of the excellent quality of bituminous coal mined in Pennsylvania, it is interesting to know that the total quantity of coal washed is less than 3 per cent. of the total production.

Operations and Equipment in Marianna Tipple

Following the publication of the series of articles describing the Marianna mine, numerous inquiries concerning the handling of the coal in the tipple were received. Brief details of the method of dumping and separating the coal, as well as the class of machinery employed, are illustrated by the accompanying photographs.

After the coal has been hoisted and the cars pushed off the cage by a steam-operated pusher, they run by gravity to four crossover dumps, shown in Fig. 5. This photograph was taken while the dumps were in action, delivering coal to the tipple screens. Three cars can be handled on each dump per minute, and as the capacity of each car is about 6000 lb. of coal. it is evident that the four dumps enable a large tipple capacity. The dumps are extra heavy on account of the weight of the cars used, and after dumping are returned to their original position by a steam pull-back.

The Picking Tables

After the lump coal has passed over the bar screen and been weighed in the weigh pans, this large coal is dumped into steel hoppers, the bottom plates of which form reciprocating feeders, permitting the coal to be delivered uniformly onto the picking bands. Fig. 1 shows one of these hoppers feeding coal onto the six-foot picking table, or beaded flight conveyer. Fig. 1 shows the receiving end of the conveyer, while Fig. 6 is a view of the delivering end of the picking table or conveyer. The hoppers shown in Fig. 6 and located directly over the picking table, are designed to deliver nut and slack coal, to be combined in any desired proportion with picked lump upon delivery to the railroad cars. Three men, facing the feed end, walk on each

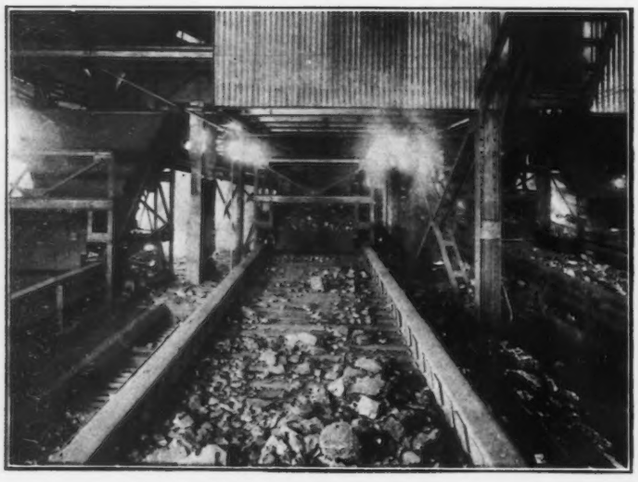


Fig. 1. Another View of the Picking Tables and Hopper. The View Shows the Receiving End of the Flight Conveyer

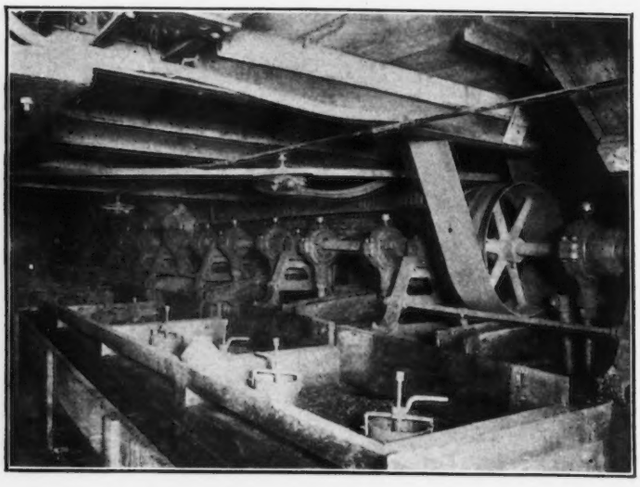


Fig. 2. Interior View of Washer Building, Showing Belt Drive to Jigs

Fig. 3. Showing Scraper Conveyer Running from Screening Plant to Jigs

Fig. 4. Hexagonal Revolving Screens, 6 Ft. in Diameter and 20 Ft. Long

conveyer or picking table and throw out the bone coal and slate picked from the conveyer. This method of having the pickers walk along on top of the coal seems to give better results than the method of having the men remain stationary at the side of the table.

Fig. 3 shows the style of double-strand. reinforced, inclined scraper conveyer used to carry the fine coal from the rescreening plant to the jigs. The chains of this conveyer, as in the whole plant, are of the reversible pin and reversible bushing steel-roller type.

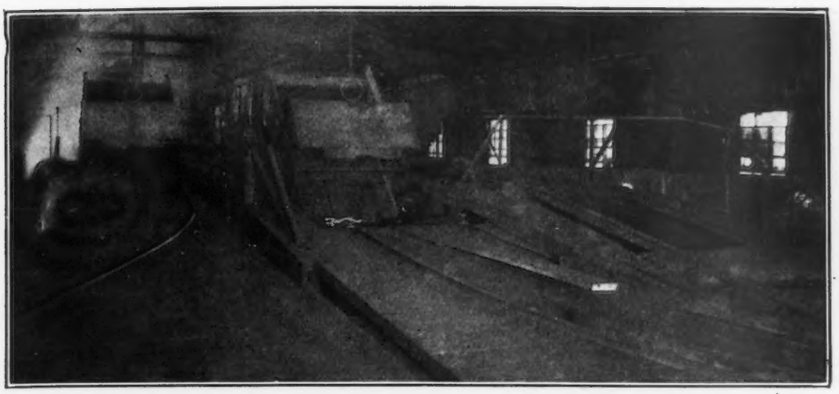


FIG. 5. SHOWING PHILLIPS CROSS-OVER DUMPS IN ACTION AT MARIANNA

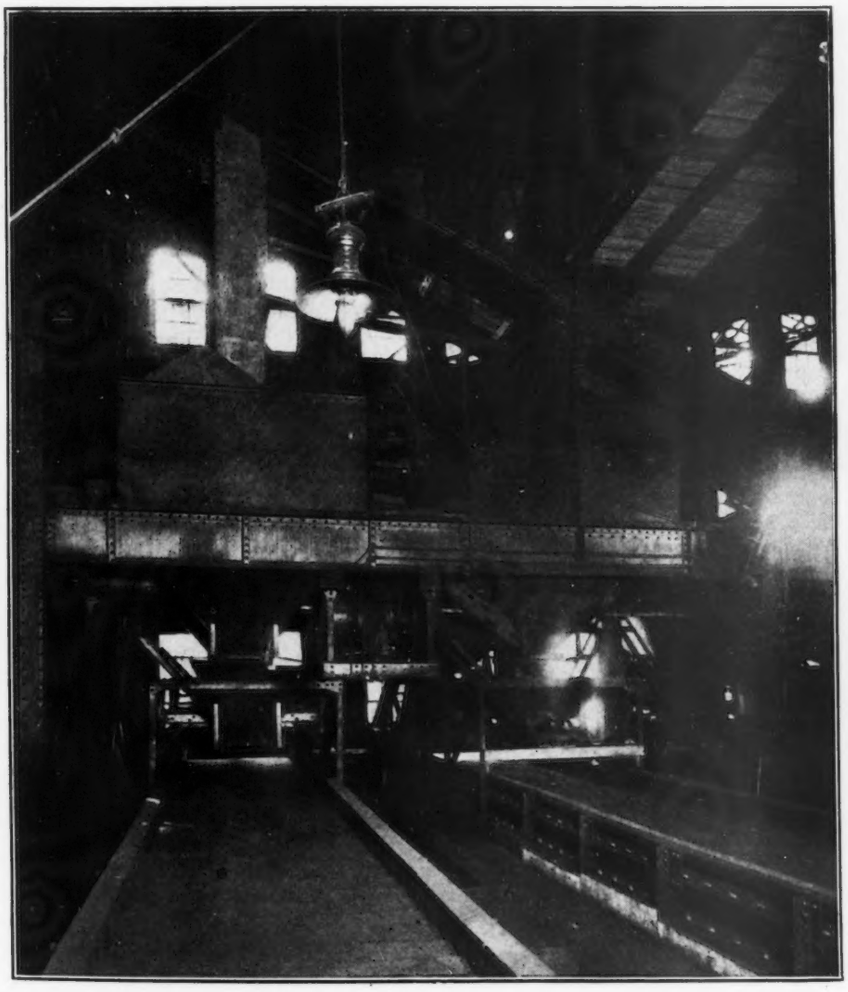


FIG. 6. INTERIOR OF MARIANNA TIPPLE, SHOWING BINS FOR SLACK COAL AND THE FLIGHT CONVEYERS

THE HEXAGONAL REVOLVING SCREENS

Fig. 4 is a view of the hexagonal revolving screens. These screens are 6 ft. in diameter, 20 ft. long, and are mounted on 5 15/16 in. shafts. The screens are built with reversible panels of heavy steel-wire cloth to handle a nominal capacity of 250 tons per hour of nut and slack coal. The coal delivered to the revolving screens is brought from the tipple screens in continuous bucket elevators to the top of the tipple building, where the hexagon screens are located. These revolving screens separate the coal into nut (between ¾ in. and ¼ in.) and slack (below ¾ in.).

Fig. 2 shows an interior view of the washery. The jigs are placed below the dumping and above the picking floor of the tipple. The jigs are driven by eccentrics on line shafts revolved by an electric motor. The washery is of the Luhrig type and has a capacity of 150 tons per hour. Practically all of the machinery shown in the illustrations accompanying this brief description was manufactured by the Jeffrey Manufacturing Company, Columbus, Ohio.

An Electric Automatic Transportation Line

The Automatic Transportation Company, Buffalo N. Y., claims to have perfected a system which makes it possible for a mining property situated where the character of the country is such that the construction of steam roads is prohibitive in cost, to secure a safe, speedy and economical means of transportation for coal or other minerals.

The transportation line is operated electrically and consists of a series of iron posts resting on concrete foundations, capped with malleable-iron Y's which support insulated heavy steel rails. The electric carriers or motor cars draw several trailers, and by a new adapation of electricity take the current directly into the motors from the rails upon which they travel, doing away with the third rail or overhead trolley. The standard gage of the line is 30 in. The point of contact where the current is taken, is in a V-shaped groove from the underside of the rail, thus making it possible to operate the line under all weather conditions, as snow and sleet on the rail will not interfere with the electrical contact. Such a line has been constructed for the Nowak Coal Company, Blossburg, Penn. A large portion of this line is constructed on an 8 per cent. grade. The system does away with the tremendous cost of grading, the hight of the upright poles varying with the contour of the surface of the earth. The line at Blossburg has a capacity of 1000 tons per day.

Criticism of Illinois Coal Mining

By David Ross *

The indiscriminate use of powder in Illinois mines causes a loss of approximately $3,000,000 annually. The certification of coal miners, as now conducted, is severely criticized.

*Secretary of State Bureau of Labor Statistics, Springfield, Ill.

†Abstract of coal report for 1910.

Attention has frequently been directed to the producing capacity of coal mines of Illinois. In the record of mine operations presented in this year's report this feature is particularly emphasized. The shipping mines were operated but 179 days during the year. This greatly reduced working time is accounted for in part, because of the failure of the miners and operators to agree upon a wage scale in consequence of which mining was suspended from April 1 to Sept. 9, 1910. As considerable time was necessary to get the mines in shape after the settlement, practically six months were lost, three of which are included in this report. Substantially all of the mines closed during April, May and June, excepting a few in fifth- and ninth-scale districts, whose owners late in May settled on the terms proposed by the miners. Notwithstanding the suspension covered one-fourth of the present fiscal year, the total coal output was 48,717,853 tons, or 445,857 tons less than for the year preceding, indicating how far in advance the present producing equipment is over normal market requirements.

One-half of the present number of mines operating on a basis of full time could easily supply all the coal for which there is an existing market. The economic effect of two men contesting for one man's job is painfully apparent in the coal-mining industry of this State, and there is everywhere evidence of the ruinous results which necessarily follow such a condition. Unfortunately, the chief beneficiaries of the situation are the railroads and other great consumers who are thus enabled to name the price they pay for fuel. Everyone, except the favored interests, have regrets to express, but no one any lawful remedy to offer. It is safe to say that there is no other legitimate business interest in the State that has to such an extent been overdone, or where the margin between the actual cost on the entire production and the selling value, is so close. The prices charged local users, often considered excessive, are required in many instances, it is alleged, to offset the losses sustained in large contracts. So fierce has become this competitive war, that even the profits on local supplies are anticipated and discounted in order to keep in the business at all.

Business Cannot Be Increased by Reducing Wages

After much unnecessary travail the trade has recovered from the delusion that commercial business can be increased by reducing wages. That plan has been tried with lamentable results. As nearly everything except the element of labor cost has been lost or given away, neither the wage payer or wage receiver has anything to gain through any attempt to reduce labor values and where such attempts have been frustrated through combined action on the part of the mine workers, the effect it would seem has proved a distinct benefit to the entire industry.

If wage reductions are to be used as an excuse for cutting prices and additional business can be secured only by offering such inducements, certainly the employer is not the gainer. As wages and other elements of real cost determine, within certain recognized competitive limits, the selling price of all commodities and, if profits are to be disregarded, and the business in a way conducted for the charitable purpose of furnishing men employment, why not make their work worth while? Why not include enough to provide not only liberal wages while employed, but a reasonable amount to cover inevitable accidents, unemployment, sickness or old age? Better that the men who risk their lives and health in the pursuit of an industry be well compensated than that the product of their labors be forced upon a glutted market and sacrificed at a value much below what it ought to bring.

It is unnecessary at this time to go into a discussion of the operating causes contributing to bring about the conditions complained of. Whether the great excess of capital and labor in the business was encouraged by the anthracite strike in 1902, which, while it continued, curtailed the general coal output, widened bituminous markets and notably increased prices; whether the acquisition and development by railroad interests of immense coal areas on the pretext that it was necessary to insure an uninterrupted supply, or, whether it should be charged to the stupidity of the American Congress in refusing to amend the Sherman Anti-Trust Act to authorize combinations in restraint of trade and to fix and control prices, is not now of any special importance because there should be more concern over plans for partial recovery than about conditions causing invalidity.

The Miners' Examining Boards Lack Discrimination

When the act requiring the examination and certification of coal miners in this State became effective it was feared in addition to the controlling influence it would give the mine workers' union, that there might result an actual scarcity of men. Whatever objections may be urged against that regulation, it cannot be said to have had the effect of curtailing the number of mine workers, for under it there has been no difficulty in securing a passport to the mines. The records of the various miners' examining boards seem to show that every one who had the required fee also possessed the necessary qualifications. It is a matter of regret that its operation has not been more discriminative in its obvious purpose to elevate the standard of the service.

A business loses its distinctive character when it becomes so simple that anyone can adopt it. It requires no particular ability to drill a hole, especially with a machine, fill it with powder and delegate the danger of its discharge to some other workmen. In respect to one-half of the total coal output of the State, this is the condition to which the mining industry has descended, and in consequence the coal mines of the country have become the collecting centers for much of the indifferent, incompetent and unclassified labor of the world. The commendable motive back of the present-day conservation movement is the avoidance of unnecessary waste and expense and the admittedly wasteful methods that mark much of modern mining, require that some steps be taken to prevent the continued drain upon the lives and energies of the people and the physical resources of the State. There is no sound basis for the fear expressed by some ultra-conservationists that there is any probability of an early exhaustion of fuel.

That old miser, the sun, ages ago stored away in the strata of Illinois alone enough coal to supply all the industrial wants of the United States for several hundred years to come. It is not the quantity available, but the plan of extracting what is needed for present uses that interest this generation.

In the thicker seams of coal where the room-and-pillar system prevails, much of it is left in the earth and a considerable per cent. of what is taken out, where it is the custom to blast from the solid, is of no commercial value. It is against this form of mining that most criticism is directed, and it will be of interest to note the cost and the extent of territory in this State to which it applies.

The Criminal Use of Powder

Out of 390, the total number of shipping mines operated this year, 225 blast coal from the solid. These exclusively solid-blasting mines employed 22,731 men and produced 25,500,000 tons, or a little over one-half of the aggregate tonnage for the State. In the production of this coal there was exploded 1,000,000 kegs of qowder, 25,000,000, lb. or 12,500 tons. Each employee used about 1,100 lb. producing but a fraction over one ton for each pound of powder consumed. As to the marketable quality of the product, statements vary, some asserting that fully 50 per cent. is unfit for consumption. The 1,000,000 kegs of powder, according to the contract rate, cost the miners $1,750,000, add to this the cost of 688 shot-firers at $4.00 per day, 179 days, or $500,000, brings the total to $2,250,000 per annum. These items do not include all the expense which the using of powder involves. The record this year shows that 17 men lost their lives directly on account of powder explosions and as the statute puts a value of $10,000 on each life, would add another $170,000 to the cost. This is not all, as many lives are lost because of falling rock and coal loosened on account of blasting, the net expense would foot up nearly $3,000,000. Is this not too high a price to pay for destroying coal and killing men?

What have the miners and operators done toward changing these conditions? Beyond a few unimportant experiments with so-called safety explosives, nothing has been attempted. The question of absolutely prohibiting the use of all explosives in coal mines has never been publicly considered in this State. When the mine inspectors two years ago, recommended a law prohibiting solid blasting in entries or other narrow work, the only response came from certain mine workers criticizing the effort as an attempt to increase their work without increasing their compensation. In the cause of this suggested reform it was not expected that powder manufacturers would enlist or that operators who realize considerable profit from powder sales, would become enthusiastic. The practice of solid shooting in narrow work is now practically confined to Sangamon county. Other districts, if they ever permitted it, abandoned it years ago. In the table relating to solid-shooting mines the extra cost to the Sangamon county miners is shown. It required 213,970 kegs of powder to produce 4,353,890 tons, while in Williamson county under similar conditions, but where the coal in all narow work is cut, half a million tons more of coal was produced with 7,517 less kegs of powder, the purchase price of this additional powder with extra work in drilling and a diminished per capita product, came out of the wages of Sangamon county miners.

Probably Not Possible to Abolish Explosives Entirely

Whether it is possible with the operation of thick coal seams and the material now available in the mines to dispense entirely with the use of explosives or substitutes therefor, may be questioned, but much of the unjustifiable waste of present methods could be immediately avoided by requiring that all coal be undercut before shooting. Where machines were not employed this would mean a return to the lost art of pick mining and incidentally an increase in the cost thereof, as it would require more time and a higher grade of skilled labor to produce coal. This would not necessarily mean a net increase in the cost of production, so much as a readjustment of present labor relations. The employment of practical miners would notably reduce the present cost of powder and other supplies; it would also reduce if not entirely dispense with the services of shot-firers and the expense of many accidents, a great part of the wealth that is now diverted into these channels would find its way into the pay envelop of the practical, competent pick man. Out of the surplus men in the mines of Illinois surely there are a sufficient number to perform the work of mining coal in the now solid-shooting mines, or who, under the inducement of added compensation, would be willing to learn, considering that present demands do not require their employment for much more than one-half of the year.

A Check upon Excess Production

No more effectual check could be placed upon excess capacity and production than through the adoption of a system that would require the employment of practical, experienced men to mine coal. While the volume at rush seasons might not be so great, the quality would be better and the operations conducted in a more intelligent and workmanlike manner. The men employed at the working places of the solid-shooting mines are not miners, in the sense that term should be understood, the character of their work does not confer upon them that distinction; they are at best but drillers, blasters and loaders, employments which, while calling for some physical strength, demand no special tact or ability and as a sequence American coal mines are now overcrowded with legions of mere manual laborers. It is fitting that with the general impairment of the craft, its legitimate implements should disappear. Investigators report that in the class of mines referred to the sight of the pick as a source of surprise. Once in a great while the remnants of one is discovered, but its use is chiefly confined to the unlawful practice of opening powder kegs.

Men who have come up from the rank of apprentices at a time and under conditions that required some knowledge of the art of real mining, justly regret the methods through which the industry is rapidly becoming impaired.

If our coal resources are to be intelligently conserved, a more merchantable article produced, accidents avoided, the business put upon a higher plane, wages and profits increased, these, and other considerations, can be realized only by the abandonment of present plans with all the frightful waste and unnecessary expense they entail and the substitution therefor of a system that would encourage the employment of practical pick men and suitably reward skilful work.

COLLIERY NOTES

It is dangerous, and should be illegal, to use in one shot any two classes, grades or qualities of explosives.

In every mine where, by reason of its depth or the extent of its workings, egress to the surface cannot be conveniently obtained, there should be provided suitable places for sanitary uses, which should be deodorized and constantly maintained in a sanitary condition.

There should never be any hesitation or delay on the part of a mine superintendent in withdrawing all of his men from a mine after the first indication of trouble underground. Don't investigate first; clear the workings immediately, and then start an investigation of the trouble.

Men familiar with the anthracite industry have come to the conclusion that the limit of annual production has about been reached, and that this kind of coal is becoming more and more a luxury, according to an advance chapter, on the production of anthracite coal from "Mineral resources of the United States, calendar year 1909," prepared by E. W. Parker, of the United States Geological Survey. "It must be apparent to all," the author states, "* * * that its use will be continued at prices that will not reduce the cost of living."

The mining laws of each State should require that an accurate map of every abandoned mine shall be kept on file in the office of the chief State mine inspector. The plan should indicate the boundaries of the workings of such mines up to the time of their abandonment. It is not necessary, and is probably inadvisable, for such a map to be open to inspection without the consent of the owner of the mine. On the other hand, it should be provided that the chief mine inspector, or other authorized official of the department of mines, may, for the purpose of guarding the safety of mine operations in adjacent properties, take from such deposited map such measurements or information as may be necessary.

Mining and Metallurgical Patents

A copy of the specifications of any of these patents issued by the United States Patent Office will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. British patents are supplied at 40 cents. In ordering specifications, correspondents are requested to give the number, name of inventor and date of issue.

A Classified List of New Inventions

COAL AND COKE

COKE—Apparatus for Determining Water in Coke, etc. James A. P. Crisfield, Philadelphia, Penn., assignor to the United Gas Improvement Company, Philadelphia, Penn. (U. S. No. 982,765; January 24, 1911.)

COKE—Apparatus for Quenching, Screening and Loading Coke. Albert Goodall, Spennymoor, England. (U. S. No. 982,590; Jan. 24, 1911.)

COKE—Improvements in Coke-Oven Doors. J. F. Peters, Ligonier, Penn. (Brit. No. 778 of 1910.)

COKE—Leveling Ram for Coke Ovens. Louis Wilputte, Joliet, Ill. (U. S. No. 981,732; Jan. 17, 1911.)

COKE—Spraying Mechanism for Coke Ovens. Thomas J. Mitchell, Uniontown, and James A. McCreary, Connellsville, Penn. (U. S. No. 982,625; Jan. 24, 1911.)

COKE-OVEN GASES—Improvements in or Relating to the Treatment of Gases from Coke Ovens or Gas Retorts. A. O. Jones, Whitley Bay, Eng. (Brit. No. 26,428 of 1909.)

CONVEYERS—Improvements in Conveyers or Screens for Coal and Other Minerals or Materials. William Henry Barker, Jr., Stoke-on-Trent, Eng. (Brit. No. 30,123 of 1909.)

EXPLOSIONS—Improved Process for Preventing Explosions of Coal Dust in Coal Mines. Hermann Kruskopf, Dortmund, Germany. (Brit. No. 4592 of 1910.)

MINING MACHINE. Spencer Jay Teller, Unadilla, N. Y., assignor to Jeffrey Manufacturing Company. (U. S. No. 979,597; Dec. 27, 1910.)

WASHER—Coal Washer. Newton A. Smith, Marion, Ill., assignor of one-half to Samuel H. Goodall, Marion, Ill. (U. S. No. 979,584; Dec. 27, 1910.)

COPPER

EXTRACTION—A Process of Extracting Copper from Ore and Slags and Apparatus Therefor. Anthony Gadomsky, Tiflis, Russia. (Brit. No. 3965 of 1910.)

SMELTING PROCESS and Apparatus Therefor. Richard Fleming, New Rochelle, N. Y. (U. S. No. 981,850; Jan. 17, 1911.)

GOLD AND SILVER

CONCENTRATOR AND AMALGAMATOR. Robert L. Royse, Martinsville, Ind. (U. S. No. 979,706; Dec. 27, 1910.)

CYANIDING—Improvements in and Relating to Rotary Filters for Separating Liquids from Materials and for Washing and Saturating Materials with Liquids. T. Breakell, Derby, Eng. (Brit. No. 28,945 of 1909.)

CYANIDING—Slime Filter. Elvin H. Lutz, Hay Springs, Neb., and Edward J. Sheda, Denver, Colo. (U. S. No. 983,735; Feb. 7, 1911.)

SEPARATION—Centrifugal Sluicing Machine. Anders Ponten, Berkeley, Cal., assignor of forty-five one-hundredths to James D. Millar, Portland, Ore. (U. S. No. 980,001; Dec. 27, 1910.)

IRON AND STEEL

BLAST FURNACE—Method of Treating Ores by the Blast-Furnace Process. Fredrik Adolf Kjellin, Stockholm, Sweden. (U. S. No. 983,453; Feb. 7, 1911.)

FERROBORON—Method of Producing Ferroboron. Charles A. Hansen, Schenectady, N. Y., assignor to General Electric Company. (U. S. No. 982,135; Jan. 17, 1911.)

ORE TREATMENT—Methods of Recovering Iron from Ores and Preparing Iron Alloys. A. S. Ramage, Buffalo, N. Y. (Brit. No. 27,806 of 1909.)

REFINING—Improvements in the Process of Refining Steel. Soc. Anon. Electro-metallurgique (Procedes Paul Girod), Ugine (Savoie), France. (Brit. Nos. 26,588 of 1909 and 27,003 of 1909.)

LEAD, ZINC AND OTHER METALS

MAGNESIUM-ZINC ALLOY. Walter Rübel, Berlin, Germany. (U. S. No. 982,022; Jan. 17, 1911.)

SODIUM—Means for the Electrolytic Manufacture of Sodium. Paul Léon Hulin, Grenoble, France, assignor to Société d'Electro-Chimie, Paris, France, and Paul Léon Hulin, Grenoble, France. (U. S. No. 979,497; Dec. 27, 1910.)

TIN—Process of Detinning Tin Scraps. Carl von der Linde, St. Tönis, near Crefeld, Germany. (U. S. No. 981,775; Jan. 17, 1911.)

ZINC—Process of Separation. Henry A. Wentworth, Newton, Mass., assignor to Huff Electrostatic Separator Company, Boston, Mass. (U. S. No. 980,035; Dec. 27, 1910.)

NONMETALLIC MINERALS

BITUMINOUS SANDROCK — Process of Treating Bituminous Sandrock. Henry F. Williams, San Francisco, Cal. (U. S. No. 983,851; Feb. 7, 1911.)

CEMENT—An Improved Wet Process for the Treatment of Rock Material, More Particularly Raw Materials for Cement. Amme, Giesecke and Konegen Akt., Brunswick, Germany. (Brit. No. 27,568 of 1910.)

MINING—GENERAL

BLASTING—Chemical Shot Firer. John Dowd, Chicopee, Kan. (U. S. No. 981,073; Jan. 10, 1911.)

CONVEYER BUCKET. Sebern A. Cooney, Trenton, N. J., assignor of one-half to John A. Roebling's Sons Co., Trenton, N. J. (U. S. No. 979,653; Dec. 27, 1910.)

CROSSHEAD—Safety Shaft-Sinking Crosshead. Thomas Bryant, Butte, Mont., assignor of one-half to Arthur H. Wethey, Butte, Mont. (U. S. No. 983,120; Jan. 31, 1911.)

DRILLING—Improvements in Compressed-Air Drilling Tools. Belgian Pneumatic Tool Co., Brussels, Belgium. (Brit. No. 24,277 of 1910.)

HOISTING—Safety Mechanism for Mine Cages and Elevators. Thomas G. Baird, Ladd, Ill. (U. S. No. 981,908; Jan. 17, 1911.)

MINE-CAR DUMPING APPARATUS. Chas. A. Griffith, Pruden, Tenn. (U. S. No. 982,426; Jan. 24, 1911.)

MINER'S LAMP. George Laws, Philipsburg, Penn. (U. S. No. 982,612; Jan. 24, 1911.)

PROPS—Improvements in or Relating to Mine Props. Mannesmannrohrenwerke, Düsseldorf, Germany, and Friedrich Sommer, Essen, Germany. (Brit. No. 4850 of 1910.)

ORE DRESSING—GENERAL

CLASSIFIER — Hydraulic Classifier for Ores. James N. Flood, Denver, Colo. (U. S. No. 982,583; Jan. 24, 1911.)

CONCENTRATION—Improvements in or relating to the Concentration of Ores. H. L. Sulman, A. H. Higgins and J. Ballott, London, Eng. (Brit. No. 28,933 of 1909.)

CONCENTRATOR—Dry Concentrator. Samuel K. Behrend, Denver, Colo. (U. S. No. 983,803; Feb. 7, 1911.)

CONCENTRATOR—Ore Concentrator. Samuel K. Behrend, Denver, Colo. (U. S. No. 982,785; Jan. 31, 1911.)

CRUSHING—Centrifugal-Impact Pulverizer. Don O. Marks, Los Angeles, Cal., assignor of one-half to Lynn S. Atkinson, Colorado Springs, Colo. (U. S. No. 982,516; Jan. 24, 1911.)

CRUSHING—Ore Pulverizer. John J. Knight, Alameda, Cal., assignor to Knight-Conlon Pulverizing Mill Company, San Francisco, Cal., a Corporation of California. (U. S. No. 983,067; Jan. 31, 1911.)

CRUSHING—Rock and Ore Crusher. Bruce W. Traylor, New York, N. Y (U. S. No. 980,575; Jan. 3, 1911.)

CRUSHING—Improvements in and Relating to Pneumatic Ore Stamps, Hammers and the Like. H. C. Behr, Johannesburg, Transvaal. (Brit. No. 14,753 of 1910.)

CRUSHING—Tube Mill. Povl T. Lindhard, New York, N. Y., assignor to F. L. Smidth & Co., New York, N. Y. (U. S. Nos. 983,068 and 983,069; Jan. 31, 1911.)

JIG—Ore Jig. H. Foust, Galena, Kan. (U. S. No. 983,616; Feb. 7, 1911.)

ORE FEEDER—Automatic Ore Feeder. C. T. Hutchinson, Oakland, Cal. (U. S. No. 983,621; Feb. 7, 1911.)

SEPARATION—Process for Dry Ore Separation. William W. Bonson, Dubuque, Iowa, assignor to Bonson Dry Concentrator Company, Dubuque, Iowa. (U. S. No. 980,890; Jan. 3, 1911.)

METALLURGY—GENERAL

AIR—Improvements in the Drying of Air for Supply to Metallurgical Furnaces. Jas. Bliss, Manchester, Eng. (Brit. No. 28,099 of 1909.)

BRIQUETTING—Manufacture of Ore Briquets for Metallurgical or Other Purposes. William Frederick Collins, London, England. (U. S. No. 982,796; Jan. 31, 1911.)

CRUCIBLE FURNACES—Improvements in Gas-fired and Like Crucible Furnaces. Fletcher Russell & Co., Ltd., and Thomas William Fletcher, Warrington, Eng. (Brit. No. 9940 of 1910.)

DESULPHURIZING—Process for Reducing and Desulphurizing Refractory Ores. Chas. Anderson Case, New York, N. Y., assignor, by mesne assignments, to Ore Desulphurization Company. (U. S. No. 982,245; Jan. 24, 1911.)

DESULPHURIZING APPARATUS for Refractory Ores. Charles Anderson Case, New York, N. Y., assignor by mesne assignments, to Ore Desulphurization Company. (U. S. No. 982,243; Jan. 24, 1911.)

ELECTRIC FURNACE for Metallurgical Purposes. Paul Girod, Ugine, France. (U. S. No. 13,186; Dec. 27, 1910.)

ELECTRIC FURNACES—Improvements in Electric Furnaces. James Henry Reid, Newark, N. J. (Brit. No. 1189 of 1910.)

ELECTRIC FURNACES—Improvement in Electric Induction Smelting Furnaces. A. Hiorth, Christiana, Norway. (Brit. No. 12,214 of 1910.)

ELECTRIC FURNACES—Means for Regulating the Electrodes in Electric Smelting Furnaces. Aktiebolaget Elektrometall, Stockholm, Sweden. (Brit. No. 12,430 of 1910.)

ELECTRIC FURNACES—Methods of and Means for Charging Electric Resistance Furnaces. A. Petersson, Odda, Hungary. (Brit. No. 6035 of 1910.)

ELECTRIC FURNACES—Method of Supplying Electric Furnaces with Polyphase Currents. Paul Girod, Ugine, France. (U. S. No. 983,043; Jan. 31, 1911.)

ELECTRIC FURNACES—Method of Supplying Electric Furnaces with Triphase Currents. Société Anonyme Electrometallurgique, Ugine, France. (Brit. No. 3421 of 1910.)

EXTRACTION—Improvements in or Relating to the Extraction of Metals from Their Ores. W. Hommel and H. T. Durant, London, Eng. (Brit. No. 28,611 of 1909.)

FURNACE DOOR—Door for Metallurgical Furnaces and Ovens. Charles Nelson Hooper, Dubuque, Iowa. (U. S. No. 983,494; Feb. 7, 1911.)

REGENERATIVE FURNACE. Arthur W. Catton and Charles W. Catton, West Seattle, Wash. (U. S. No. 979,647; Dec. 27, 1910.)

ROASTING—Improvements in Dust-preventing Ore-discharge Apparatus, for Use more Especially with Roasting Furnaces. Thomas Edwards, Ballarat, Victoria, Australia. (Brit. No. 14,957 of 1910.)

ROASTING — Dust-preventing Ore-dropping Apparatus and the Like for Roasting Furnaces. Thomas Edwards, Ballarat, Victoria, Australia. (U. S. No. 979,937; Dec. 27, 1910.)

SLAG—Process of Granulating Molten Slag. Heinrich Colloseus, Berlin, Germany. (U. S. No. 980,606; Jan. 3, 1911.)

SLAG CEMENT—Process of Manufacturing Cement from Molten Furnace Slag. Carl von Forell, Hamburg, Germany, assignor, by mesne assignments, to the Atlas Portland Cement Company. (U. S. No. 982,945; Jan. 31, 1911.)

SMELTING FURNACE. Corydon Willard Munson, Toledo, Ohio, assignor, by mesne assignments, to C. W. Munson, trustee. (U. S. No. 983,833; Feb. 7, 1911.)

TUYERE—Charles Anderson Case, New York, N. Y., assignor, by mesne assignments, to Ore Desulphurization Company. (U. S. No. 982,244; Jan. 24, 1911.)

PERSONAL

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Henry M. Howe has gone abroad.

J. E. McAllister, of British Columbia, has been visiting New York.

R. B. Lamb, of Toronto, Ont., is in Porcupine on professional business.

J. W. Mercer is back from Ecuador and will remain in New York indefinitely.

John C. Worth, of Philadelphia, has gone to Prescott, Arizona, on professional business.

H. C. Cutler has been making an examination in the Seven Troughs district in Nevada.

Dr. Royal P. Jarvis, of Knoxville, Tenn., has been examining some Georgia gold properties.

M. F. Campbell, of Mazatlan, Mexico, is in Los Angeles, Cal., making a sale of mining property in Sinaloa.

A. L. Queneau has opened an office as metallurgical engineer, at 929 Chestnut street, Philadelphia, Penn.

Chas. A. Giffen has made a sale of his placer interests on the Rio Mata, in Colombia, to Los Angeles people.

E. M. Hamilton has left Lluvia de Oro, and is now with the Dolores Mines Company at Madera, Chihuahua, Mexico.

W. G. Page, Salt Lake City, who has been in Los Angeles, Cal., for some time, has gone to Utah to examine placer territory.

Howard D. Smith, of San Francisco, is making an examination of the Dutch & Sweeney mine, Tuolumne county, Cal., for New York people.

J. W. Jay, president, and Leon Gibert, of New Orleans, La., are inspecting the mines of the Wadsworth Red Ash Coal Company at Falliston, Alabama.

Frank M. Myers, of Seattle Wash., is at Tuolumne, Cal., making an examination of the Spring Gulch mine, now under bond to Thos. Winwood and associates.

Stewart Thorne, late manager of the Peterson Lake Company, at Cobalt, has gone to Porcupine, Ont., as manager for the Preston and East Dome mines.

George T. Haldeman, late instructor in mining at the University of Pittsburg, has been appointed superintendent of the mine-rescue work of the Lehigh Valley Coal Company.

Judge E. H. Gary, chairman of the board of the United States Steel Corporation, is spending a short vacation in the South. He will return to New York about the beginning of March.

Charles S. Simpson, for eight years superintendent of the Burt-Sellers mine at Hibbing, Minn., and in the employ of the Oliver Iron Mining Company for 14 years, has resigned and will remove to California.

Capt. Joseph Hodgson, who has been principal operating man for the iron-ore mines of the Breitung estate in the Lake Superior region, has been appointed general superintendent. His assistant will be W. B. Bauder.

George L. Carter, president, and J. M. Roan, manager, of the Clinchfield Corporation, have resigned. Before going to the Clinchfield company three years ago, Mr. Roan was with the Sunday Creek Coal Company, of Ohio.

Fred W. Solomon, assistant superintendent of the concentrator of the Steptoe Valley Smelting and Mining Company, has been appointed superintendent of the Miami concentrator and will leave at once to take charge at Miami.

John E. Patton, who has been directing the Continental Coal Corporation as vice-president and general manager, has been elected president of the Sewanee Fuel and Iron Company, at a recent meeting of the board of directors.

Banks Hudson has resigned as blast-furnace manager of the Alabama Consolidated Coal and Iron Co., at Gadsden, Ala., effective March 1. He will on that date enter the employ of the Lake Superior Iron and Chemical Company.

R. M. Churchman, formerly connected with the coal interests of M. A. Hanna & Co., at Toledo, has severed that relation and formed a co-partnership with Ford Cate. The new firm will open an office in the Moffatt building at Detroit.

E. F. Lake, Avenue B and Forty-seventh street, Bayonne, N. J., announces that he has severed his connection with the *American Machinist* as steel editor, and will hereafter act in the capacity of a special correspondent and consulting metallurgist.

White Smith, Bishop, Cal., has successfully financed his salt company, and in a few weeks will begin the construction of a 15-mile electric tramway to carry the salt from Saline valley across the White mountains to the Southern Pacific Railway, at Owneyo.

W. H. McFadden has resigned as vice-president and general manager of Mackintosh, Hempill & Co., Pittsburg, to take effect March 1. Mr. McFadden has taken an active part in the construction and installation of many of the most important steel mills in the country.

James E. Russell, of Deadwood, S. D., is at Campo Bonito, Arizona, engaged in an exhaustive examination of this Campo Bonito and the adjoining Southern Belle mines, with Col. Wm. F. Cody, with a view to the enlargement of the present plant and to more extensive operations if the properties warrant such procedure.

George E. Sylvester has been appointed chief mine inspector of Tennessee, in place of R. A. Shiflett, who has held the position for several years. Mr. Sylvester is a graduate of the Massachusetts Institute of Technology, and has practised as a mining engineer in Tennessee for 18 years, having his headquarters at Rockwood in Roane county.

Frank Koester, previously with the Interborough Rapid Transit Construction Company, J. G. White & Co., the Guggenheim Exploration Company, and the American Smelting and Refining Company, recently opened an office at 115 Broadway, New York, as consulting engineer. Mr. Koester is author of "Steam Electric Power Plants" and "Hydroelectric Developments and Engineering."

Dr. J. B. McConnell, of Montreal, and Robert Devine, of Ottawa, arrived in Porcupine recently, where they are acting as representatives of Bewick, Moreing & Co., of London, in the purchase of options on gold properties. Engineers Pope and Kuehn had been previously at work for some weeks, inspecting properties in the interest of the syndicate. About 72 claims have been submitted to Doctor McConnell. It is now announced on the authority of a banking firm concerned in the transaction, that the Bewick-Moring syndicate has taken over the development of fifty of the Timmins, McMartin & Dunlap claims outside of the Hollinger and Miller-Middleton group. Engineers are to be put to work at once.

OBITUARY

William A. Baldwin died at Sewickley, Penn., Feb. 17, aged 76 years. He was born in Philadelphia and educated as an engineer. He was for many years connected with the Pennsylvania Railroad, and rose to a prominent position on its western lines. Later he was vice-president of the Buffalo, Rochester & Pittsburg. He was for a number of years president of the Walhonding Coal Company. He retired from active business some years ago, but retained his coal interests.

SOCIETIES and TECHNICAL SCHOOLS

University of Pittsburg—Recent appointments in the School of Mines are Dr. Charles R. Eastman, of Harvard University, as professor of paleontology; Otto Emery Jennings, of the Carnegie Museum, as instructor in paleobotany, and James Z. Zimmerman as assistant in mining.

American Institute of Chemical Engineers—The third semi-annual meeting will be held in Chicago, June 21 to 24. Arrangements will be made to visit a number of the large technical plants in the vicinity. The committees on Chemical Engineering Education and Standardization of Boiler Tests will have important reports to present.

Editorial Correspondence

Reports from our own Representatives on Important Events from Many Important Mining Centers of the World

San Francisco

Feb. 15—A bill has been introduced in both houses of the legislature disputing the constitutional right of the Federal Government to withdraw from entry public lands included in the forest reserve, and for irrigation and power purposes, and such lands as were withdrawn by President Taft, which are covered by oil-placer claims. The bill provides for an amendment to the State constitution, Art. 13, Sec. 1, by inserting the following words respecting Government lands exempt from taxation: "Other than lands now or hereafter withdrawn from entry, leased, rented, or contracted for by the United States for forest reserves, water-power purposes, oil, oil mining, coal, coal mining, or any other purpose than a Government purpose." The amendment does not assume to interfere with the ordinary Federal right to continue the policy of disposing of the public domain by the usual methods of homestead entry and the filing of mining claims. But insists that the Government cannot otherwise dispose of such lands; that it violates its covenant with the State by leasing, renting and contracting otherwise than in disposal as originally contemplated by the Constitution. Assuming this, the authors of the bill further assume and provide for the amendment of the Political Code in Sections 3607 and 3629, thus directing United States district attorneys to furnish statements of all taxable property belonging to, claimed by, or in the possession of, under the control or management of the United States on the first Monday in March of each year. The proponents of the bill, which they seem seriously to desire shall be enacted into a law, hold and assume by its terms that lands so withdrawn from entry are not only subject to taxation by the State, but subject to disposal by the United States only through and by laws that may be enacted by the State.

Rather a peculiar, if not uncomfortable position for the Federal Government, to be required by the State of California to pay taxes on lands which it may not dispose of as it deems best. This may seem to the advocates of the measure an easy and valid method of destroying the effects of, or the attempts at conservation, and protection of the public domain from the rapacity of land grabbers and unscrupulous placer claimants. But such purpose is unbelievable. If the object of the bill is merely to collect taxes on 30,000,000 acres, or about one billion dollars worth of public lands, and thus reduce the tax rate on other property, that would be a more commendable exercise of the power of legislation, for thus gain of a substantial kind must fall to the beneficiaries of such a law. Were such right of State government declared and made constitutional, even the purpose of pecuniary gain by the State would not be accomplished, for it is beyond reasonable conjecture that the Federal Government would then take further concern in the conservation or regulation of the public lands. Whatever the purpose of the bill, the present effect must be the disturbance of the efforts of California's delegation at Washington to accomplish remedial legislation in respect to the location and patenting of oil placers.

The advisability of attempting legislation respecting the protection of oil measures against infiltration is being seriously considered, and has attracted some comment, the consensus of which is that the question would be best forgotten until there shall come a demand by the big producers for legislative interference in a matter that does not directly concern the whole public. True there are many good laws that have for their purpose and effect the benefit of a part of the community in whom the balance have no particular interest. The purpose of controlling or regulating water infiltration in the oilfields is by no means a selfish one, nor would such regulation necessarily work a hardship in the accomplishment of benefits. The danger is that in such regulative inspection as would be necessary there is liability of making public certain information which the driller of wells has the moral and lawful right to withhold. The only economic and efficient method, at present apparent to practical oil men, by which administrative control of the matter could be accomplished would be the keeping of an accurate log of each well drilled, which must be submitted to an inspector acting under the law of the State. It has been proposed that such well logs be filed with a public official, such as the recorder of the county. But this plan would be unfair in that it would make public just the sort of detail that petroleum operators very much desire to keep to themselves. The filing of such logs with a State official would obviate publicity, but it is questionable if the State of California or any other oil-producing State would provide compensation equal to the value of the services of a man competent to perform the duties of such office. There has been great progress in the education of petroleum mining engineers in California, gained chiefly in the practical school of experience and experiment and observation; but the number of men competent to satisfactorily handle the water question is limited. Given every detail of information possible in a log record, and otherwise available, respecting a particular well and such neighboring wells as may affect the well under consideration, the result of the effort to control infiltration is by no means always and entirely satisfactory. So the desire for legislative action would better subside in deference to the advice of some of the oil men who have spoken.

Denver

Feb. 16—On Feb. 9 an explosion occurred in the Cokedale mine, 9 miles northwest of Trinidad; 17 men lost their lives. The mine is owned by the Carbon Coal and Coke Company, a subsidiary company of the American Smelting and Refining Company, with Franklin Guiterman as president and general manager, and F. P. Bayles, resident superintendent.

This property has long been known as the "Model Mine" in which every known safety device has been installed by the manager, who was also the first to install the modern rescue apparatus. It was visited last year by the State Mining Commission appointed by Governor Shafroth, the members of which expresed their enthusiasm over the condition in which the mine workings and the whole camp was found. Three hundred men were employed, and the output was about 1500 tons daily, all of which was shipped to the American Smelting and Refining Company. It has been operated for four years.

In the report to the Governor, Dr. Victor Alderson, chairman of the State Mining Commission, referred to the Cokedale mine as the only one in the State that could be called entirely safe. The entire press of Colorado, in fact, has united in calling it the "Model Mine," and therefore genuine sympathy has been expressed for the management in this deplorable accident. So far it has been ascertained that gas was not the cause of the explosion, but the result of the ignition of a car of powder by some

kind of shock. The coroner's inquest, held at Trinidad, exonerated the company from blame.

Senator Cassaday's "Anti-strikebreakers" bill passed the third reading and will now be submitted to the House. If this measure is passed it will record a victory for the labor element in the higher branch of the Assembly.

Representative Allen, of the Colorado legislature, with the Massachusetts statutes and decisions relating to the construction of the Hoosac tunnel as his guide, has drawn up a bill providing for the building by the State of what is known as the Moffat tunnel, through the main range of the Rocky mountains, from the eastern to the western slope, the money for the construction to be provided by an issue of $5,000,000 of 4 per cent. bonds. So far as understood at present, the tunnel is to be "open to all railroads." Presumably this means that other railways could use the tunnel by traffic agreement with Mr. Moffat, who is operating his line close to the point where the eastern portal of the tunnel would be, and westward on the other side from where the Pacific slope portal would be. No railroad company would build an independent line 50 miles from Denver to the tunnel, at a cost of, say, $40,000 per mile, and down the other side, when there is a line already constructed, over which it would make traffic arrangements. The cost of building this tunnel, which would be about 2½ miles in length, is estimated roughly at $5,000,000, and the time to be occupied in driving, about four years. It would be of the greatest importance in the matter of bituminous and anthracite fuel supply of Denver, and the development of the Yampa coalfield, as it has been now amply demonstrated that coal cannot be hauled in quantity sufficient to meet even the present demand, or at a profit, over 23 miles of 4 per cent. grade. There is a market at this writing for 5000 tons per day of the bituminous coal of the Oak Creek district, through which the Moffat road is now being operated, and one-fourth of this demand at present cannot be supplied. The other great advantage to the State will be the placing of Denver on a transcontinental line, should the tunnel be used by the Denver & Rio Grande, Burlington or Rock Island, one or more of which railroads might probably avail themselves of it.

Salt Lake City

Feb. 16—State Coal Mine Inspector J. E. Pettit has reported to Governor Spry concerning the recent trouble at the Independent Coal and Coke Company's mine at Kenilworth. The trouble started because the scales got out of order for a short time, and the miners contended that they were being robbed on weights. The superintendent offered to allow them to have a representative present, which was agreed to at first by the foreigners, but later the ringleaders made a fuss, and refused to go to work. About 15 Greeks were discharged, and escorted out of camp. They returned, and incited other dissatisfied Greeks, Austrians and Italians to violance. The report states that dissatisfaction had existed among all the foreigners, the Austrians having planned the outbreak, which the Greeks carried into execution. There were 160 Greeks, out of the 254 miners employed. Armed guards will remain at the mine for some time, and more of the foreigners will be dropped. The report states that for a large vein of coal the company pays a higher price for coal mined than any mine in the State.

Hancock, Mich.

Feb. 11—When the circulars announcing the outline of the proposed Calumet & Hecla merger were first published, the plan was received, as all such plans are, with a variety of different opinions, depending to a great extent upon how deeply various individuals would be affected by the shuffling of shares, which must take place. After the first surprise had somewhat subsided, the usual rumors of opposition to the plan commenced to circulate. In commenting, the press in general, but the technical publications in particular have been somewhat prone to state and reiterate that those who are now opposing the merger will, upon further investigation, see that it is all for the best, and that in the end the opposition will simmer down to nothing and that general contentment will prevail.

A short sojourn in the Lake Superior country forces one to believe, and with considerable reason, that the real opposition has just started. The general sentiment is distinctly opposed to the Osceola and Ahmeek being absorbed by any merger and from circulars that have been printed in the copper-country newspapers it is apparent that the stockholders of these two companies at least, are to make a determined stand against the consolidation.

Toronto

Feb. 17—On Feb. 15 a deputation of mining men and others from Northern Ontario, numbering about 400, had an interview with Premier Sir James Whitney, Hon. Frank Cochrane, and other members of the provincal Government. They strongly urged the construction by the Government of a branch line of railway from Charlton on the Temiskaming & Northern Ontario Railway, through the Elk Lake district to Gowganda, contending that in addition to opening up the mining area it would encourage agricultural settlement and the lumbering industry. It was pointed out that large quantities of low-grade ore had been accumulated, which could not be shipped at a profit without railway communication. W. R. Hensey, of New York, president of the Bishop Silver Mining Company, and and otherwise largely interested in Gowganda, said he was prepared to take in machinery as soon as the building of the road was assured. If the railway were built the interests he represents were prepared to pay $10,000 per year to the Government for five years. A memorial was presented by the deputation suggesting as an alternative proposition, in case the Government did not consider it advisable to build the line, that a charter would be granted to private parties with a clause agreeing to permit junction connection with the Temiskaming & Northern Ontario, and that the Government should further agree not to construct any competing line.

The reports of the Premier and Mr. Cochrane, though non-committal, were decidedly favorable in tone. The latter asked for further and more detailed information as to what tonnage could be expected from the Gowganda mines in case the road was built. He advised the deputation to appoint a committee to secure this information and said that the Government would coöperate in obtaining it. They would then be in a position to give a definite answer.

Johannesburg

Feb. 2—A new amalgamation is announced. It is proposed to amalgamate the Randfontein Central and Randfontein South mine, which is itself an amalgamation of several producing mines. The 600-stamp mill of the Randfontein Central is designed to crush 1,900,000 tons per annum; there are 16 tube mills, but by increasing the number, the capacity of the mill can be increased by 400,000 tons. It is proposed to increase the crushing capacity to 3,500,000 tons per annum, but it is more likely that crushing will be more and more centralized, and some of the 100-stamp mills may be closed.

The combined property will consist of 2150 claims, extending for seven miles along the reef, which includes three or more payshoots, some of which have been but little developed. The total ore reserve, Nov. 30, 1910, was 6,055,016 tons of 6.9 dwt. ore, or sufficient for 18 months' mill supply. Shortage of labor probably accounts for the lack of development work.

In December, 1909, there were 174,000 unskilled laborers employed in the gold, diamond and tin mines of the Transvaal, but the estimated number required was 224,000; the shortage was, therefore, about 50,000. In December, 1910, 197,000 natives were available, but the number required was 227,000, so the estimated deficiency has increased from 50,000 in 1909 to 80,000 in 1910.

The Mining News

Reports of New Enterprises. New Machinery. Installations. Development Work and Property Transfers. The Current History of Mining

Alaska

Mineral Creek Power—This company has been incorporated by Joseph Burke, F. M. Boyle and others, of Valdez, who are contemplating the construction of a large power plant. They will also erect a customs mill to handle the ores of the vicinity.

Gold Bullion—Five stamps are to be installed on the property this spring. H. D. Cowen is superintendent. Headquarters are in Seattle.

Alaska Northern Railway—This company is considering the purchase of a large automobile car for the accommodation of the traveling public. The car will accommodate 60 passengers, and will be operated by gasolene power. Construction work on the railroad will be stopped for the season unless the Alaska coal mines are opened up.

Brooklyn Development—The stamp mill for this property is being transported over the snow, and will be in operation at an early date. K. A. McVean, Knik, has charge.

Chicagoff—The new stamp mill now being erected on this property, on Chicagoff island, will be in operation in two months. Mr. Archangel, Sitka, has charge of the work.

Alaska Mexican—The mill ran 30 days in December; crushed 17,347 tons of ore; produced $61,434, at an operating expense of $35,960. The yield per ton of ore was $3.57.

Alabama

The finishing work is being done in the State mine inspector's office on the report of the coal production in Alabama during 1910. Already nearly 16,000,000 tons of coal have been reported and a few more mines are yet to be heard from. Chief Inspector James Hillhouse says that he would not be surprised to see the production go to 16,500,000 tons. There was a decided falling off in the number of men killed in mines during 1910 from falling rock and coal, as compared to the number in 1909. Fifty-five men lost their lives from these causes in 1910 against 70 in 1909. The number of men killed in the Alabama mines during the year 1910, however, went far above 1909, as two explosions killed 130 men. There were 235 men killed in the mines last year.

Arizona

Miami—One of the churn drills has been moved to the Red Spring claim, north of the center of the company's holdings. It is intended to explore this ground as soon as possible. This hole is 1000 ft. north and about 800 ft. west of the No. 4, or main working shaft. The other two churn drills will be continued at exploration work in the western part of the property. In the underground workings the mine is rapidly being placed in position for the time when it will be required to supply the concentrator.

Cochise County

Calumet & Arizona—Superior & Pittsburg—Stockholders authorized an increase in capital stock from 200,000 to 650,000 shares to provide for acquisition of Superior & Pittsburg on the basis of one of Calumet & Arizona for three and one-half of Superior & Pittsburg. When the exchange is completed there will be outstanding 628,571 shares of Calumet & Arizona, leaving 21,429 shares in the treasury.

Copper Belle—This property, near Gleeson under bond to the Shannon Copper Company is reported to have opened good ore recently.

Gila County

Inspiration—The Colorado shaft has been sunk to a depth of 635 ft. To reach a depth corresponding to that of the station on the 500-ft. level of the Bush shaft it will be necessary to sink 25 ft. further. As soon as the sump is cut and a station completed on the new level it is the intention to start a crosscut to connect with the Bush shaft.

Mohave County

The Sacramento Valley Mining Company, operating near Kingman, will install new hoisting equipment. Extensive operations are planned.

Pima County

A site for the establishment of a customs smeltery by the Arizona Consolidated Smelting and Mining Company was ordered donated to the company in a meeting of the directors of the Tucson chamber of commerce. M. A. Bixby is installing 600 h.p. electrical apparatus for the company.

California

Amador County

Geological Survey figures for 1909 credit Amador county with gold output of $2,298,785 and silver, $16,701; an increase over 1908 of $422,611 gold and $3462 silver.

It is reported that damage suits are to be brought against the Zelia, the Argonaut and the Kennedy mining companies by residents south of Ione, charging that débris from these mines has filled the bed of Jackson creek above Jackson valley bridge connecting Buena Vista and Lancha Planta sections with Ione.

Bunker Hill—The cleanup for January is reported at more than $20,000. In the last four years this mine has been paying dividends, under the superindency of E. H. Harrington.

Plymouth—There is insistent rumor that this old mine near Plymouth is to be reopened.

Central Eureka—The January cleanup is reported at $14,500.

Bunker Hill—The vein has been opened for about 500 ft. on the 1950-ft. level for a width of nearly 20 ft.; 20 new stamps are expected to be dropping before the end of February.

Amador Queen No. 1—The east and west drifts on the 1200-ft. level will be extended after the mine has been unwatered. C. D. Porter, San Francisco, is working the mine under bond.

Kennedy—The 100-stamp mill is operating steadily.

Butte County

Gold production in Butte county, according to report of United States Geological Survey for 1909, was $2,987,079, a decrease of $152,319 from 1908; silver for 1909, $7,205, a decrease of $5,903.

Calaveras County

Lightner—This mine at Angels Camp is closed on account of water. Superintendent Oberg is planning for installation of machinery for economic drainage. The company is being sued by James V. Coleman for tresspass in extracting ore from the Angels mine adjoining.

Eldorado County

Mother Lode Mines—This company, under the direction of W. A. Hooton, will reopen the Old Kelsey mine near Placerville.

Fresno County

Coalinga Peerless—This company has 19 wells and is selling to the Associated on contract.

Coalinga Eight—Well No. 1, finished in January with 300 bbl. output, has in-

creased to 500 bbl. a day. No. 2, after being drilled 2000 ft. with rotary, is being continued with a churn drill. No. 3 also was drilled 2000 ft. with rotary.

IMPERIAL COUNTY

United Mines—This company has completed equipment for operating the old Hedges mine which has been renamed the Tumco, near Ogilby, a station on the main line of the Southern Pacific.

INYO COUNTY

Skidoo—The mill treated 1155 tons of ore in December, producing $19,893 at a cost of $8332.

KERN COUNTY

Butte Lode—The Rice lease on this mine near Randsburg has proved profitable. Edward Shippey is the present leaser.

Brogan—J. H. Hartman has discovered a ledge on this old prospect near Piute.

Gold Bug—Barney Osdick, leaser on this mine in Stringer district owned by D. J. McCormick, will install a cyanide plant to be removed from the idle Kenyon mine.

MARIPOSA COUNTY

Mariposa Commercial and Mining—Manager Maguire is reported to have said that the company has not sold the estate known as the Mariposa grant to a company of stockmen.

MONO COUNTY

The electric power line, with generating plant at Lundy, has been completed to the Wonder mining district in Nevada, and will be in operation as soon as the storms permit. The line is more than 100 miles long.

NEVADA COUNTY

Birchville—This mine continued work during the January and February storm, driving a crosscut and keeping 12 men employed. The ore in the main shaft is galena and gold-bearing quartz.

Republic—A body of ore is being opened in the lower levels, but the working force has been reduced on account of the bad weather.

Gaston—The operation of the 10-stamp mill has been resumed.

Erie—Twenty men are at work on this mine, and unless the second storm stops them, normal conditions will be soon resumed.

Union Hill—L. B. Dow, of San Francisco, principal owner, has contracted with the Nevada City Miners' foundry for a new 20-stamp mill to be erected at this mine just east of Grass Valley. After being unwatered the 600-ft. shaft will be sunk to further depth.

PLUMAS COUNTY

Placer claims aggregating about 5000 acres have been surrendered to the Federal Government by E. A. Jackson, manager of the North Star Mining Company, as nonmineral lands. Since the adoption of the policy of surrender, about 50,000 acres in Plumas and the adjoining county of Butte are said to have been turned back to the Government.

SAN BERNARDINO COUNTY

Several reports have come from the Stringer district that tungsten deposits have been encountered in placer workings. No definite information has been made public, except that the occurrence of gold- and tungsten-bearing ground extends for a width of about 60 feet.

SAN DIEGO COUNTY

Gem Mines—Nine claims of 180 acres east of Ramona have been sold to E. G. Logan and A. W. Pray, practical gem miners, who expect to increase the scope of operation.

Colorado

The cornerstone of the new Federal building and Denver post office has been laid, and the exterior of the building will be constructed entirely of the white marble from the Yule Creek quarries and supplied by the Colorado-Yule Marble Company. The first story will be occupied by the post office, the second by the court rooms and the third and fourth by the various Federal bureaus. The architects are Tracy, Swartwout and Litchfield, of New York. It will be a building in all respects appropriate to its importance, for which we are indebted to the efforts of Senator Guggenheim.

The Colorado Fuel and Iron Company has made its first shipment of steel rails for the laying of the line of the Laramie, Hahn's Peak & Pacific Railway, from Fox Park, Wyoming, to their coal mines near Walden, in North Park, Colorado.

BOULDER COUNTY

The Mining Association Mining and Sampling Company, Boulder, Colo., will build a custom mill, concentrator and cyanide plant.

CLEAR CREEK COUNTY

Scepter—At 1900 ft. from the portal of the tunnel in Democrat mountain, a 2-ft. vein of gold and silver ore of high grade has been opened and 100 sacks are ready for shipment.

Capital—It is stated that the production of this mine has increased so rapidly that the management contemplates putting a night shift in the mill to keep up with the output. Every leaser is said to be in pay ore, and the same is true of the ground worked on company account.

Mendota—The mill is running steadily and 3 cars of zinc concentrates were shipped last week. A 2-ft. vein of solid galena has been opened in the mine for a length of 50 feet.

LAKE COUNTY—LEADVILLE

It is said that after 33 years of mining, Fryer hill is still producing largely, with plenty of virgin ground yet to be explored, and that since Jan. 1 new orebodies have been found in the Climax, Virginus, Dunkin and Nevada claims. The ore is principally silver-lead.

SAN JUAN REGION

Hidden Treasure—The mill at Lake City, closed since 1907, will be remodeled and capacity increased by installing more Wilfley tables, slimers and a larger generator (water power). A concrete dam is being built above the mill.

Kittemac—The mill, at Silverton, will be increased in capacity from 100 to probably 200 tons daily capacity.

Yellow Medicine—This company, at Capitol City, is considering the installation of a 50-ton concentrating mill in the spring.

Atlas—Ten more stamps, two Wilfley tables and two Deister tables will be installed in the mill at Sneffels in the spring.

Mickey Breen—J. H. Anderson, manager, Ouray, expects to install a 100-ton concentrating mill on the property in the spring; also a tram for the Grizzly Bear mine.

SUMMIT COUNTY

Bolivar Mining Company—This company is making plans to build a 150-ton mill, for the Motter process, at Montezuma. It is the intention of the company to operate this as a custom mill.

TELLER COUNTY

The sale of the Golden Cycle mine, in the Cripple Creek district, was announced in the JOURNAL as having been made to the Consolidated Goldfields of South Africa. This announcement has been made many times by the local press, but is again authoritatively denied by the president of the company. It begins to look as if the corporation had a very active and astute press agent.

Dante—Twenty-three carloads of ore were shipped from this Bull Hill mine in January by the lessees.

Granite—Fifty-five carloads was the January output of the Granite mine at Victor. It is stated that several new discoveries have been made in the Gold Coin mine now owned by the Granite Company.

Jennie Sample—William Trumback, lessee, has opened a 3-ft. vein of ore. The first carload has been shipped.

Ajax Company—Nelson & Co., lessees of the June Blizzard, on Battle mountain, owned by the Ajax company, are stated to have opened a 5-ft. vein of high-grade ore at 310 ft. depth and a carload has been shipped.

Forest Queen—During the last six months, 170 cars of dump ore have been shipped by John Connors, lessee.

Michigan

Copper Region

Hancock—Practically everything is in readiness about this property to begin shipments to the Allouez-Centennial mill. The surface equipment is ready for regular service and underground the necessary timbering is being done preparatory to the maintenance of regular production. An order has been closed for the electrical haulage system that will handle the ore tributary to No. 1 to No. 2 shaft, through which it will be hoisted to surface.

Houghton—The shaft being sunk at this property has reached a depth of 260 ft. When 400 ft. is reached a crosscut will be started to the Baltic lode.

Calumet & Hecla—The erection of the structural-steel collar and skip houses at No. 13, 14, 15 and 16 shafts on the Osceola Amygdaloid lode, has been completed.

Bohemia—No. 5 drill hole has encountered a copper-bearing amygdaloid lode at a depth of about 875 ft. This is in all probability the same formation that was exposed by No. 1 hole at a point about 2000 ft. south.

Winona-King Philip—It is understood that at the annual meeting of the Winona Copper Company, to be held next month, a plan will probably be announced for a merger with the King Philip.

Quincy—From its 1910 operations this company will have paid to stockholders, with the current disbursement, a total of $4.75 per share, or $522,500 on the outstanding stock. The dividend of $1 just declared, although payable in 1911, will be derived from operations during the last three months of 1910.

Minnesota

Vermillion Range

Merrifield—The recent discoveries east of the river have attracted the attention of explorers to the possibilities that there are west of the Mississippi river. Some drilling is being done by Richelieu and Whitesides, in this vicinity north of Merrifield.

Brainerd—By June 1 this company expects to have a shaft started on its property south of the city of Brainerd.

Montana

A bill now before the house provides that the provisions of the common law relative to fellow servants and the assumption of risk as defences in negligence actions shall be abrogated, thus leaving contributory negligence alone as a defence. The act has been reported favorably in the house, but has yet to get through the senate. This is a sweeping in ovation and will doubtless meet with determined opposition on behalf of the corporations.

Butte District

La France—Tests are still being made to determine a process for treatment of the ore of the Lexington mine.

Laurium-Montana—The company has recently been organized with the following officers: August Hilden, president; Oscar Karri, vice-president and general manager, and William Nousianen, secretary and treasurer. The property is a short distance west of Butte. It is the intention to start development work at once.

Tuolumne—The contract has been renewed with the Washoe smeltery at a better rate than formerly. The East Butte and the Garfield smelteries at Salt Lake also bid for the contract.

Stewart—The mine is said to be earning $20,000 net each month on 350 tons of milling ore per day. This will be increased to 450 tons.

Deer Lodge County

Gold Coin—Yegen Brothers have recently given a 60-day option on the property to Paul L. Klein, of Denver. The purchase price is $25,000.

Granite County

Royal—William Recksiek & Co., of Butte, have a lease on this mine in the Princeton district.

Sunday—Leasers have recently shipped a car of high-grade ore.

Northern Bell—The surface plant has been completed and the shaft is being sunk on a well defined vein.

Lewis and Clark County

New Hampshire—A cyanide plant will be erected at this mine in the Gold Creek district.

Fourth of July—This mine recently made a shipment of gold.

Lawful—This claim has been leased to Anaconda men. A cyanide plant will be built.

Madison County

William Watson, head of the company which located about 4000 acres of placer land, east of Virginia City, last fall, will arrive in April to establish a permanent camp near that city.

The property owned by Con Cotter, near Easton, is being leased by Amos Fox and James Beckerleg, who have opened up a good body of gold ore.

Winnetka—Tunnel No. 2 is now in 200 ft. and a raise is being run to connect with tunnel No. 3 which will be intersected 195 ft. from its portal. A 35-ton mill will be built in April.

Bartlett—At a point 350 ft. from the portal of the main tunnel a winze is being sunk on a 4-ft. vein of ore and is now down 14 ft. The ore will be treated in the Shafter mill after April, when the Apex company's lease on the mill expires.

Montana-Illinois—The company has recently made a strike on its property situated near Mammoth.

Nevada

Humboldt County

A new strike of high-grade gold ore has been made on the north side of Winnemucca mountain that has caused quite a stampede to the new district.

Dailey Mining and Milling—This company, in the Seven Troughs district, 32 miles northwest of Lovelocks, has leased the Mazuma Hills property. A contract has been let for sinking 400 ft. of shaft.

Florence—A shipment of 25 tons of ore, said to be worth $8000 per ton, was recently made.

Seven Troughs Coalition—The tailings from the 10-stamp mill assay $10 per ton and are being impounded. A cyanide plant is to be built; L. A. Friedman, president and general manager.

Washoe County

Wedekind—Operations at this mine, five miles from Reno, have been resumed.

New Mexico

The lead ores of the Cutter mines, near Albuquerque, are said to be vanadiferous. Some of the analyses show 50 per cent. lead sulphate and 8 to 15 per cent. vanadium oxide. A mill for the treatment of the ore is being built and is expected to be running in March; the cost will be $150,000. L. S. White is manager.

Grant County

Chemung—The company intends to resume operations in the near future and develop its known orebodies.

Oklahoma

United—A 200-ton zinc concentrator is to be built near Davis.

Arbuckle—The company has a 150-ton zinc concentrator in transit for the Goose Nest mine.

Oregon

Josephine County

Waldo—New machinery is being installed, under the direction of Frank Leland, Grants Pass.

Utah

The local United States assay office, during January, handled 8,403.33 oz. gold, valued at $156,341, and 5,383.82 oz. silver, valued at $2584, making a total value of bullion received of $158,925, which was sent to the mint in Denver.

The shipment of the various forms of hydrocarbons of Uintah county, Utah, close to the Colorado State line, chief of

which is that known as gilsonite, is practically controlled by the asphalt "trust," which owns the Uintah railway, extending from the principal mines at Dragon to Mack, a station on the Denver & Rio Grande Railway. This road is about 50 miles long, narrow gage, with maximum 7 per cent. grade and operated with Shay engines. M. W. Rooney, general manager of the line, now announces that he will extend his road nine miles to the northeast, toward the White river, his object being to connect with a pipe line, which is to be built south nine miles from the Rangely oilfields in Raven Park, where several wells have been brought in, but lack transportation for their product. One of the companies drilling wells, is at Meeker, one at Vernal and another in Denver, known as the Hildebrand Syndicate. This oilfield is in Rio Blanco county, Colorado, and occupies a basin about 15 miles in length by five miles in width and has been fully described by Hoyt Gale, in *Bull.* 350, U. S. Geological Survey.

Juab County

Tintic shipments for the week ended Feb. 10 totaled 150 cars, including one car of slag shipped from the Tintic smeltery.

Beck Tunnel—On Feb. 9, all differences between this company and the Uncle Sam were settled out of court. The Beck Tunnel gave the Uncle Sam 200 ft. of ground along the course of the new orebody. The settlement allows both companies to proceed with ore extraction. The Uncle Sam claimed apex rights to the orebody in dispute, but relinquishes its right to follow the ore south into Beck Tunnel ground. It also has the privilege of using the Beck Tunnel workings in the extraction of its ores.

May Day—Leasers are sinking a winze from the 400-ft. level, and are down 60 ft. in ore.

Iron Blossom—Work has been started to sink the No. 3 shaft from the 500- to the 600-ft. level, from which point it is proposed to drift under the cave. Some experiments are still being carried on with silicious gold-silver ores from this property, and from the Colorado, with a view to possible treatment of material not now available for shipping.

Yankee Consolidated—An accident in the shaft, Feb. 10, caused the death of two miners. Four men were being hoisted with drill steel, and at the 1000-ft. level one of the drills caught between the cage and timbering, knocking one man off of the cage and crushing another. Both men were in the employ of the contractors, who are sinking the shaft to the 1700 level.

Lower Mammoth—At the directors' meeting, Feb. 9, it was decided to give out leases on the 400- to the 1000-ft. level.

Colorado—Work in the territory north of the Sioux line is reported to have opened lead-carbonate ore, running well in silver within the main body of lower grade material.

Salt Lake County

Ohio Copper—Development work is being continued in the mine, and some of the levels have been connected with the shaft, which extends to the Mascotte tunnel. Work on the Elvina vein has opened some higher grade copper ore than the usual run of the mine. The ore in the vein itself is solid sulphide, and the walls, especially the foot, are heavily mineralized for some distance. A representative of the company has gone East to confer with Col. E. A. Wall in regard to installing rolls in the remaining two units of the mill.

Utah Leasing—Silicious ore from the old Telegraph mine at Bingham, carrying gold and silver, is being slimed and cyanided by this company and a satisfactory saving is reported. Heretofore about 8000 tons running $5 to $12 a ton was shipped for converter lining. About 40 tons are being treated daily.

Silver Shield—Development on and below the Niagara tunnel level has opened fromb 5 to 6 ft. of ore, a part of which is of shipping grade.

Bingham Copper—Drifting has been done on the two fissures which were cut in the tunnel near the 1200-ft. point.

Columbus Consolidated—Roads have been broken down the cañon and hauling ore began Feb. 9. Sleds are used for about half of the 16-mile haul to the railroad, and the ore is then transferred into wagons.

Utah Mines Coalition—A force of men under Manager Strickland has returned from Big Cottonwood, after investigating as much as possible the damage caused by the snowslide of Jan. 30. A tunnel was driven through the ice, snow and scattered timbers to the compressor plant, and the compressor and motor found standing on their foundations, practically uninjured. A new boarding house, compressor building, blacksmith shop and assay office will be built in as sheltered a situation as possible, when the weather moderates, and concrete obstructions may be built to prevent or break up further slides. The damage is estimated at about $10,000.

Summit County

Shipments from Park City for the week ended Feb. 10, made by the Daly Judge, American Flag, Little Bell, Daly West and Silver King, totaled 1,882,170 lb. The shipments for January amounted to approximately 5618 tons for the camp.

The Snake Creek tunnel at Park City was driven 367 ft. during January. On Feb. 2, the face was in 2790 ft. from the portal. The ditch was completed for 2750 ft., permanent ties, for 2475 ft., and ventilating pipe placed in position for 2725 ft. Up to Jan. 22, an average progress of 15 ft. per day was made, when bad ground was encountered, which caused the contractors to reduce their working force and narrow the width of the heading. Up to the 2654-ft. point, the tunnel was driven through hard, blue limestone. Here a porphyry dike about 30 ft. wide was cut, after which the country rock was decomposed black limestone, which brought in water at the rate of about 50 gal. a minute. Both the limestone and porphyry dike are mineralized with pyrite. The water flows to about the 1600-ft. point, and disappears in a fissure. At present no water is being delivered at the portal. The loose ground has been temporarily caught up with 10x10-in. posts and green aspen lagging, which will be replaced by tunnel sets. On Feb. 2, the full-width heading was 2769 ft. in, and from here on a 5-ft. drift was driven on the west side to the 2890-ft. point. No water is coming in at the face.

Virginia—A shipment of several cars of ore has been made recently from the California-Comstock.

New York Bonanza—Shipping ore has now been followed on the 900 level for 190 ft., and ranges from 6 in. to 2 ft. in thickness.

Silver King Coalition—It is reported that ore has been encountered in the old Uintah-Treasure Hill territory, by raising from the Coalition workings.

Silver King Consolidated—New ore has been opened on the 1550 level.

Tooele County

The International Smelting and Refining Company's Tooele plant has been receiving more ore, and, though still running at half capacity, is reported to be making better than expenses. The cooling tower, which was damaged by the severe storms last month, has been entirely repaired. Hot water from the roasters is utilized as feed water for the boilers. Preliminary surveys have been run from Tooele to near Grantsville, where there are limestone quarries, to learn where limestone can be secured, should it be required. General Manager E. P. Mathewson left Feb. 10 for Butte after a three days' visit to the smeltery. There has been little complaint from the farmers in regard to smeltery fumes, as the stack is at the mouth of Pine cañon, which draws the smoke and fumes largely toward the mountains, away from the farming land.

Galena—A leasing company has been formed to work this property at Stockton. The development will be in charge of James Creighton.

Cliff—Owing to snowstorms and wet weather, the roads between Ophir and

St. John are badly cut up, and the traction outfit has been temporarily stopped.

Ophir Hill—Work on the new 3000-ft. drain tunnel has been delayed somewhat by an accident to the compressor.

Lion Hill Consolidated—The Buffalo tunnel was advanced 107 ft. during January, and is in at present 889 ft. to the face. On account of an accident to the Ophir Hill compressor, from which the Lion Hill gets it air, work with machine drills was suspended.

Washington

Ferry County

Little Giant—Good ore has been uncovered on this property, near Kettle Falls; J. W. Gilpin, superintendent.

First Thought—An extensive test of the ore from this mine is to be made at the cyanide mill at Napoleon, and if the test warrants, extensive improvements will be made on the property.

Priest Lake—New capital has been interested in this property at Priest lake, and operations will be started as soon as machinery can be taken to the mine.

King County

Issaquah Coal—This property, idle for eight years, has been sold to the Superior coal and Improvement Company, which will reopen the mine.

Stevens County

Aladdin—Operations are to be resumed at once and additional machinery will be installed. Frank Ernest, Northport, is president.

Whatcom County

Gold Run Mining and Milling—This company has been incorporated by William Boyd, J. M. Saar and others, with headquarters at Sumas. They have taken over several claims in the Mount Baker district, which they will develop.

Canada

British Columbia

Standard—This mine, near Silverton, is under option to Patrick Clark, of Spokane. Shipping ore has been cut in the face of No. 6 tunnel.

Hercules Consolidated Mining and Smelting Company—This company has been incorporated to acquire and develop the Reco, Trachyte and Buffalo claims on Copper mountain.

Ontario

North American Smelting Company—The company has paid the city of Kingston $2700 for a portion of the city's smeltery site on the lower harbor, and will erect a lead smelter to treat ore from their mines in Loughboro township, Frontenac county. The Canadian Northern Railway will run close to their property, enabling a spur line to be built to the mines.

Miller Lake-O'Brien—A shoot of extremely rich ore has been opened on the 140-ft. level of this Gowganda property.

Calcite Lake—This Gowganda company will shortly install a compressor plant. High-grade ore has been found at 125 ft. in depth.

Ontario-Cobalt

The ore shipments from Cobalt for the week ended Feb. 10 were: Cobalt Lake, 189,140; Kerr Lake, 180,156; McKinley-Darragh, 179,650; City of Cobalt, 66,280; O'Brien, 65,950; Nipissing, 65,020; Buffalo, 62,450; Temiskaming, 61,910; Beaver, 61,050; La Rose, 60,000; Trethewey, 50,600; total, 1,042,206 lb. The bullion shipments were: Nova Scotia, 67,376; O'Brien, 27,312; Campbell & Deyell's sampler, 7680; Nipissing, 1872; total, 104,240 ounces.

Cobalt Hydraulic—Repairs to the plant of this company, which supplies compressed air to a large number of the mines in Cobalt, have been completed, and regular service has been resumed.

Beaver—The directors of this company have decided not to commence the payment of dividends for some time yet. They have under consideration the erection of a concentrator.

Little Nipissing—A special meeting of the shareholders has been called for Feb. 24, when a request will be made that the directors be authorized to borrow money, and to issue bonds and debentures. No financial statement has as yet been presented.

Right of Way—The annual meeting was held at Ottawa, Feb. 15. The report showed sales during 1910 amounting to $233,838; dividends paid, $134,840, and balance to credit of profit and loss account, $45,027. Cash on hand and due from smelters amounted to $76,361.

Trethewey—The annual report for 1910 shows total receipts $437,552, and net revenue $237,800. The capital assets have been increased by $67,781. The total production for the year was 602 tons, containing 865,777 oz. of silver. The concentrating mill, in operation since the end of May, treated 19,013 tons of ore, producing 263 tons of concentrates containing 438,000 oz. of silver. There was cash on hand amounting to $68,078, in transit and at mine was $213,729.

Ontario-Porcupine

Imperial Crown—A compressor plant will be installed.

Porcupine United—It is probable that a compressor plant will be installed in the near future.

Preston East Dome—Contracts have been let for the sinking of four shafts and a stamp mill has been ordered.

Mexico

Chihuahua

The production of the Parral camp for January was over 50,000 tons, and for the first week of this month about 13,000 tons. The production should henceforth show considerable increase as a result of milling operations by the Alvarado Mining and Milling Company and the Veta Colorado Mining and Smelting Company.

Mexican Exploration Company—Durango, Colo., and New York people have lately perfected this organization for the acquisition and operation of the Freeman properties in the Guadalupe y Calvo section. B. N. Freeman remains with the new company as secretary and manager. It is the plan to remodel the old 10-stamp mill and add modern concentrating equipment.

Abondancia—A French syndicate has ly taken a working option on this property in the Santa Eulalia camp. The property is owned by Luis Terrazas, Jr., of Chihuahua. S. G. Burn has been placed in charge of the exploratory work.

Esmeralda-Parral—It is reported that plans are under way for the early installation of a cyanide plant. The Parral manager is Wade Armstrong, and the financial manager is W. P. Fairman, of Philadelphia.

Rio Plata—A shipment of 90 bars of silver bullion was lately made via Alamos, state of Sonora. The shipment was valued at $50,000.

Veta Colorado—This mine, near Parral, is about to commence operation. Electric generators and motors have been installed.

Guanajuato

Guanajuato Mines Syndicate—The power line to the mine is now completed.

Providencia—This company, owning the Tajo de Dolores mine, has completed the new stamp mill and cyanide plant; William H. McCord, manager.

Mexico

Esperanza—The mill ran 25 days in January; crushed 20,562 tons; produced $159,188 in bullion and concentrate at a total cost of $105,904.

Sonora

Plans are being matured for a new company with $5,000,000 capital to acquire all the Cieneguita property in the Sahuaripa district. The exchange for the old shares is proposed on the basis of 40 per cent. This will leave $3,000,000 in the treasury.

Asia

Korea

Oriental Consolidated—The mill ran 29 days in December, crushed 30,121 tons of ore, yielding $134,963 at a cost of $72,118. The net profits were $61,767.

The Markets

Coal Trade Review

New York, Feb. 21—The seaboard coal trade remains dull and rather depressed. Steam-coal demand is not active, and late winter holds back the coastwise business. Slow trade is reported almost everywhere.

Anthracite trade has not been heavy, and some competition for going business is reported.

From the West accounts continue to come of oversupply at market centers, and of sales at extremely low prices. In consequence, many mines are on short time. As is always the case at such times, there is a lot of talk about combination to regulate production and prices; but it will probably have little result. Coal men a few months ago were preparing to meet a coal scarcity; now the scarcity is in demand and the coal is going begging. Sellers and not buyers are doing the chasing.

Coal Rates to Chicago—The table below shows the freight rates on coal to Chicago allowed by the Illinois Railroad Commission. The coal mines of the State are divided into groups, from each of which a general rate is allowed. The distances given in the table are the average haul from each group:

Group:	Average Distance.	Rate Per Ton.	Per Ton, Mile.
Southern Illinois	344	$1.05	0.305c.
Harrisburg	319	1.02	0.320c.
Belleville	291	0.97	0.333c.
Springfield	238	0.82	0.344c.
Fulton County	193	0.75	0.389c.
Danville	147	0.74	0.503c.

The switching charges in Chicago on all coal amount to about 10c. per ton. From the Danville group the distance is 42.7 per cent. of that from Southern Illinois; the rate is 70.5 per cent.

Coal Traffic Notes

Coal and coke tonnage originating on all lines of the Pennsylvania Railroad Company east of Pittsburg and Erie, month of January, short tons:

	1910.	1911.	Changes.
Anthracite	1,045,274	1,101,192	I. 55,918
Bituminous	3,624,729	3,621,472	D. 3,257
Coke	1,413,157	847,140	D. 566,017
Total	6,083,160	5,569,804	D. 513,356

The total decrease this year was 8.4 per cent. The loss was chiefly in coke.

Total coal and coke tonnage of Chesapeake & Ohio railway, six months of fiscal year from July 1 to Dec. 30, short tons:

	1909.	1910.	Changes.
Points west of mines	3,879,302	5,174,264	I. 1,294,962
Points east	1,034,141	965,468	D. 68,673
Tidewater	2,578,202	2,052,567	D. 525,635
Total	7,491,645	8,192,299	I. 700,654

Total increase was 9.4 per cent. The gain was wholly in shipments to points west of mines, Eastern and tidewater tonnage having decreased.

Current Prices of Metal, Minerals, Coal and Stocks, Conditions and Commercial Statistics

A statement in the *Coal Trade Review* gives bituminous coal receipts at Chicago for the year ended Dec. 31 as follows, in short tons:

	1909.	1910.	Changes.
Ill. and Indiana	11,021,000	10,775,000	D. 246,000
Ohio	400,000	970,000	I. 570,000
West Virginia	2,740,000	2,390,000	D. 350,000
Kentucky	25,000	25,000	.....
Total	14,186,000	14,160,000	D. 26,000

The receipts from Illinois and Indiana showed very little decrease, notwithstanding the long stoppage at the Illinois mines. The deficit from that cause was largely made up from Indiana mines. The strike also was the chief cause for the large increase in Ohio coal. The decrease in West Virginia coal was rather unexpected.

New York

Anthracite

Feb. 21—The anthracite trade has been disturbed by some rumors of cut prices; but it is not clear where the cutting is coming from. At any rate everyone denies any such conduct.

Schedule prices for domestic sizes are $4.75 for lump, $5 for egg and stove and $5.25 for chestnut, all f.o.b. New York harbor. For steam sizes current quotations are $3@3.25 for pea; $2.40@2.75 for buckwheat; $1.95@2.25 for buckwheat No. 2 or rice; $1.40@1.55 for barley; all according to quality, f.o.b. New York harbor. Some washery and individual pea is said to have been sold 10c. lower.

Bituminous

The seaboard coal trade is still dull. There has been little buying for the coastwise trade, and harbor business is not heavy. All-rail trade is reported a little better, but not much.

Prices are nominally about the same. Gas coals bring $1@1.10 at mine for ¾-in., 95c.@$1 for run-of-mine, and 70c. for slack. Fair steam coals can be had for $2.60, f.o.b. New York harbor, lower grades down to $2.35@2.45, with better coals up to $2.80@2.90. There is a plenty of coal at tide, but we do not hear of any more demurrage sales.

Car supply is good. The heavy snowstorm of this week will probably interfere with transportation to some extent.

Delays at Eastern ports have made vessels for the coastwise trade harder to get. Tonnage can still be had at 75@85c. from Philadelphia to Boston or Portland; 60@70c. from New York around Cape Cod, and 40@50c. to Sound ports; but there is a tendency to put up rates.

Birmingham

Feb. 20—Contracts in hand and in sight warrant the statement that the operation of mines will be steady for some time to come. The production of coal in Alabama is better than it was at this time last year and the indications are that it will continue so. There is a large quantity of coal still going to the Southern ports, especially to New Orleans.

Coke production in Alabama is being kept up to the demand, which is not very great at the present time.

Chicago

Feb. 20—Sales of coal are naturally light because of mild weather, but shipments to this market are not so large in general as a week or two ago and prices hold up fairly. Domestic coal from Eastern and Western mines moves very slowly; steam coal has a steady market but the tendency of users is to burn screenings in mild weather. Lump, therefore, is very weak in steam coal and screenings are strong. Retailers and consumers appear to have come to the conclusion that winter is practically over, and few are buying in large quantities.

Illinois and Indiana coals bring $2@2.40 for lump, $1.70@1.90 for run-of-mine and $1.50@1.80 for screenings, in car lots. Of coals from east of Indiana, Hocking again is probably strongest, shipments now being fairly well regulated to demand, and sales being made at $3@3.15. Smokeless shipments have been reduced so that comparatively few lots are sold at low prices to escape demurrage charges; lump sells for $3.30@3.80 and run-of-mine for $2.95@3.05, lump being the stronger. Anthracite sales are very light.

Cleveland

Feb. 20—The coal business holds up fairly in comparison with the past few weeks; but it is light for the season with no signs of an early increase. Most of the mines which supply this market are running short time, so that the supply is kept pretty well down to the demand.

Slack is scarce, owing to the light production of lump. Car supply is good.

Middle district coal is $2.15 for 1¼-in., $1.90 for ¾-in., $1.80 for run-of-mine and $1.55@1.70 for slack, all Cleveland delivery. No. 8 and Cambridge districts, 5 or 10c. higher. A few sales are reported at 10c. lower for run-of-mine coal up to demurrage.

Indianapolis

Feb. 20—The coal industry is still flattened out and there is nothing to give it a more hopeful tone. Operators frankly admit their belief that the industry will not emerge from present conditions for several months. Prospects in the bituminous-coal trade are not alluring and prices are ruinously low.

The report that the recent blizzard in the Northwest increased the demand and sent the price up at the Indiana mines is denied. Indiana operators have not been working over two-thirds of the time for three weeks.

The operators blame the anti-trust law and the statutes in Indiana and Illinois, charging that they foster the kind of combination they were designed to prohibit. Amendments to the anti-trust laws are being urged to legalize price-fixing combinations among bituminous-coal operators.

Pittsburg

Feb. 21—The local coal trade shows no improvement, mines running at between 50 and 60 per cent. of capacity and prices continuing irregular. We quote: Mine-run and nut, $1; ¾-in., $1.10; 1¼-in., $1.20; slack, 82½@85c. per ton.

Connellsville Coke—The market has improved. All the slack has been taken up between production and consumption, the furnaces having used up the stock they accumulated, quite unnecessarily, to tide them over possible disturbances to the movement over the holidays. Prompt furnace coke which could not find a ready market was selling at 1.40c. and 1.45c., the last important sale at a low price being 10,000 tons of March coke to a Cleveland merchant-furnace interest at $1.40. Last week we reported the prompt market 5c. higher, and this week we advance quotations another 5c., to $1.50@1.60, and it is not certain that any important tonnage can be picked up at the lower figure. The rumor noted a week ago that a contract for second-half furnace coke was made at $1.75 proves to have been entirely without foundation. We quote: Prompt furnace, $1.50@1.60; contract furnace, $1.55@1.60; prompt foundry, $2@2.10; contract foundry, $2.25@2.50 per ton at ovens.

The *Courier* reports the production in the Connellsville and lower Connellsville region in the week ended Feb. 11 at 323,333 tons, an increase of 21,000 tons, and shipments at 3516 cars to Pittsburg, 5118 cars to points west and 799 cars to points east, a total of 9433 cars.

The Crucible Steel Company of America has bought from Josiah V. Thompson, of Uniontown, 2000 acres of Pittsburg seam coal, at approximately $800 an acre, through J. H. Hillman & Sons, Pittsburg. A trifle over half the purchase price is paid in cash, the balance being on an exchange basis, the Crucible company giving several parcels of ground, the most important being the remainder of the site of its Howe, Brown & Co. works, at Seventeenth and Pike streets, Pittsburg, abandoned several years ago. The tract lies along the west bank of the Monongahela river just above lock No. 6, in Greene county, and not far from the Marianna mine of the Pittsburg-Buffalo Company, the Jones & Laughlin Steel Company's mines and other mines recently opened in the Washington-Greene county district. The price is the highest yet paid for Greene county coal. On the other side of the river developments have been carried practically to the river, The Isabella Connellsville Coke Company's holdings lying along the river and the Tower Hill property just beyond. The coal lies 250 ft. below the river, and slopes toward the river, so that development will be by shaft a few hundred feet from the river bank. The seam is expected to produce 12,000 tons of coking coal per acre. Development will probably not start for perhaps a year, as the intention is to use river transportation exclusively, to the Crucible Steel Company's recently acquired coke oven and blast-furnace property at Midland, on the Ohio river, just below the mouth of the Beaver, and it requires the completion of one dam in the Ohio river to provide slackwater for the entire distance.

St. Louis

Feb. 20—The market this week remains unchanged; in other words it is resting on rock bottom. The cost of production has been the basis for all prices during the past 10 days, and a good many prices below the cost of production have been made to move coal at reconsigning points. In fact a number of the larger operators claim that those who are selling coal on the present market do not know how to figure their own cost of production and the market is losing at least 10c. per ton.

It is a matter of fact that the few mines which insist upon running do not figure in office expenses, selling expenses, depreciation of property, or interest on their money, as being a part of the cost of production, but seem willing to let their product go for what it actually costs to bring it to the top of the ground in order to keep their mines running.

The weather has been like July all week. The thermometer has registered around 70 to 80 deg. In fact February has been a month that has broken all records for high temperatures. The weather bureau predicts a cold wave coming, but the coal trade in general has lost all faith in weather predictions.

Current prices in the St. Louis market are as follows:

	Mine.	St. Louis.
Illinois, Standard:		
6-in. lump and egg	$1.10	$1.62
2-in. lump	1.00	1.52
Mine-run	0.90	1.42
Screenings	0.60	1.12
Trenton:		
6-in. lump and egg	2.25	2.77
3-in nut	2.00	2.52
Staunton or Mt. Olive:		
6-in. lump	1.50	2.02
2-in. lump	1.25	1.77
Mine-run	1.20	1.72
Screenings	0.60	1.12
Carterville:		
6-in. lump or egg	1.30	1.97
3-in. nut	1.20	1.87
Mine-run	1.10	1.77
Screenings	0.75	1.42
Pocahontas and New River:		
Lump or egg	2.25	4.75
Mine-run	1.25	3.75
Pennsylvania Anthracite:		
Chestnut	....	7.20
Stove or egg	....	6.95
Grate	....	6.70
Coke:		
Connellsville foundry	....	5.40
Gas house	....	4.90
Smithing	....	4 15

Prices at East St. Louis are 20c. per ton below the St. Louis quotations.

Of course the present market has made the production of lump fall off a great deal and consequently screenings are bringing good prices. Both Standard and Carterville screenings are bringing 75c. per ton at the mines. The only thing which seems to be hard to move and for which there is no apparent reason for not moving is nut coal. Domestic nut can be bought at a price very little higher than screenings.

Anthracite—The market is slow, though a pretty fair supply is being used. There is very little coming forward as the business for this year is practically at an end.

Smokeless is in a little better demand than it was several weeks ago. Dealers are introducing it very generally now and a great many people are trying it to finish out the season, who would not take it for a main season's supply.

FOREIGN·COAL·TRADE

British Coal Exports—Exports of fuel from Great Britain, with coal sent abroad for use of steamships in foreign trade, month of January, long tons:

	1910.	1911.	Changes.
Coal	4,183,230	4,956,215	I. 772,985
Coke	92,637	100,017	I. 7,380
Briquets	131,613	166,709	I. 35,096
Total exports	4,407,480	5,222,941	I. 815,461
Steamer coal	1,486,130	1,564,738	I. 78,608
Total	5,893,610	6,787,679	I. 894,069

The imports of fuel are an insignificant quantity.

Austrian Coal Production—Coal production in Austria, year ended Dec. 31, metric tons:

	1909.	1910.	Changes.
Coal	13,713,043	14,056,858	I. 343,815
Brown coal.....	26,043,716	25,157,541	D. 886,175
Total mined...	39,756,759	39,214,399	D. 542,360
Coke made.....	1,985,389	2,010,526	I. 25,137
Briquets made..	366,780	333,960	D. 32,820

Of the briquets reported in 1910, there were 185,877 tons made from brown coal or lignite.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report prices of coal on Feb. 11, as follows: Best Welsh steam coal, $4.32; seconds, $4.14; thirds, $3.96; dry coals, $3.96; best Monmouthshire, $3.96; seconds, $3.72; best small steam coal, $2.40; seconds, $2.16. All prices are per long ton, f.o.b. shipping port, cash in 30 days less 2½ per cent. discount.

IRON·TRADE·REVIEW

New York, Feb. 22—The iron trade in the past week has shown more activity and seems to be recovering from the lull which followed the heavy buying of the close of January and the opening of February. The present business is of a more diversified character, indicating that smaller manufacturers and jobbers are coming into the market for supplies. The buying of rails and other heavy material, which sent up the Steel Corporation's Jan. 31 statement, has not been resumed; but there is activity in the lighter products.

In pig iron there is more demand for foundry iron in seaboard territory. Machinery manufacturers and cast-iron pipe makers have been taking iron more freely for second-quarter needs. There has been also a call for basic iron, both in the East and in the Central West.

Buyers and sellers are still far apart in their ideas of prices for second-half deliveries, and not much business has been done beyond June. Makers are holding prices more stiffly than they have done, except for Southern iron.

In finished material quite a good deal of business has been done in bars, sheets, tinplates and wire products. Here also there is not much doing on deliveries beyond June. Structural orders are quite prominent, chiefly of the smaller class. Rail orders have been light this week, but some business in bridges and steel cars was placed. Wire products have been especially active. Upon the whole the situation is improving.

Rail Production—The American Iron and Steel Association reports the production of rails in the United States at 3,634,029 long tons, of which 1,917,900 tons were of bessemer steel, 1,715,899 of open-hearth steel and 230 tons of iron. The increase over 1909 was 610,184 tons, or 20.1 per cent. Details of the production are given elsewhere.

Baltimore

Feb. 20—Imports for the week included 1350 tons ferromanganese and 60 tons silicospiegel from Liverpool; 800 tons manganese ore from Liverpool; 9500 tons iron ore from Cuba. Exports included 236,371 lb. spelter and 3,941,920 lb. steel billets to Liverpool.

Birmingham

Feb. 20—The Southern pig-iron market continues quiet and the general quotations are around $11 per ton, No. 2 foundry. There is a rumor that some iron was sold in the Western market under $11 per ton, but no confirmation is to be secured. The make is not being improved. The home consumption is beginning to show a little improvement, though it is yet considerably under what it was three or four months ago. The cast-iron pipe makers in the Southern territory have been selling their product right along. Machine shops and foundries are doing a little but are far from being run on full time. The charcoal iron demand is holding its own with price at $22@22.50 per ton.

The steel situation alone shows activity. There is a good demand for fabricated steel, rails, wire, rods and nails, and the shipments are better than the production.

Chicago

Feb. 20—Buying of pig iron has increased generally in the last week, the foundry trade, on which this market chiefly depends, having been stimulated by the two large sales of 150,000 tons total for second- and third-quarter delivery, made to the leading agricultural-machinery manufacturers and to a pipe company. The average melter, however, is not yet ready to contract for his needs beyond the second quarter, though he will probably do so soon, to judge from the volume of inquiries about last-half possibilities. Prices are uncertain, though nominal quotations are $11 Birmingham for Southern ($15.35 Chicago) and $16 for Northern No. 2. Above and below these is a range of at least 25c. each way. The larger sales have been made at the lowest point of the market and an upward tendency is perceptible. Sales of iron and steel materials have been of moderate volume in the last week with all lines except railroad supplies well represented. Coke is quiet at $4.90 for Connellsville.

Cleveland

Feb. 20—There seems to be little anxiety among the blast furnaces about ore for the coming season. Stocks from last season are still large.

Pig Iron—There is more interest in basic iron. Quite a number of small orders are being received for both basic and foundry for second quarter. Some inquiries are in for second-half deliveries, but ideas about prices on such orders are widely divergent. Quotations, Cleveland delivery, are $15.90 for bessemer, $14.40 for basic, $14@14.25 for No. 2 foundry. There are rumors of shading on foundry.

Finished Material—There is a fair run of new orders for sheets. Bars are active and prices firmer than they have been.

Philadelphia

Feb. 21—The inquiries for pig iron during the past few days have been for large lots running in some cases into thousands of tons and deliveries extended until June 30. Buyers everywhere are on the alert and heavy dealings are looked for almost daily. Electrical concerns, machine builders, stove manufacturers and others are among those who are renewing negotiations upon much larger supplies than were asked for more than a month ago. The various grades of foundry are now the chief object of interest. The makers of what are regarded as special irons have suddenly quoted prices 50c. higher, but this advance has not been attempted on large intending buyers. The condition of the market is that of expectancy and hope rather than accomplished results. It is recognized that the current production of crude iron will not meet a vigorous and healthy demand. Certain large pig iron transactions in the West are referred to here as evidences of a widespread movement that may result in a return to normal conditions. There are makers here, however, who do not share any more sanguine views than they did two or three weeks ago. A renewal of active effort of some southern makers to unload iron in this territory has toned down the views of some makers who felt a little elated. The expected business in basic pig is as dead as ever. The bar mills are scratching along and nothing of moment is being done in gray forge. The average quotations is $14.50; basic nominally is $15 and No. 2 X foundry $16 per ton.

Steel Billets—The movement is still confined to actual requirements of users and efforts to effect sales involving late deliveries have failed.

Bars—Stores in city and country report a more liberal movement with the approach of spring and the most interesting orders of the past week have been from jobbers.

Sheets—The larger users of sheets are gradually coming in and placing orders to see them through until summer. The near approach of the building season is helping corrugated sheets.

Pipes and Tubes—The tube market is

said to show stronger undertone but the quotations given to recent inquiries show no sign of it.

Plates—The demand in the local markets is for small lots for early delivery. The placing of large car-building orders is regarded as a good omen. Capacity has not been increased but the manufacturers feel the worst of the strain is over and that a moderate increase will be possible before March is out. The smaller shops using boiler plate are picking up business.

Structural Material—A reviving demand from railroad sources is improving the outlook. The orders for the past week have been for small bridge work in some of the Atlantic Coast States, especially New England. Local requirement for construction purposes have been presented this week and will make a good showing.

Scrap—Melting scrap has been pretty well cleaned up in this market and there is a call for more. Scrap dealers are now snapping optional bids made a few weeks ago and are looking for railroad scrap, yard scrap, car wheels and axles.

Pittsburg

Feb. 21—Bookings of orders for finished-steel products have been at practically an unchanged rate since the closing days of January. They are very heavy in wire products, considerably in excess of the current capacity, fairly heavy in pipe and tinplate, fairly satisfactory in steel bars, and far below capacity in plates, shapes, rails and sheets.

Production continues to increase. The Homestead and Duquesne plants, which early in January were running at only between 25 and 30 per cent. of their finishing capacity, are now running at 75 to 80 per cent. The entire Riverside plant, at Benwood, W. Va., is being put in operation, two blast furnaces being blown in this week, while the steel mill and finishing departments will start in about a fortnight. The steel industry as a whole is operating at between 60 and 70 per cent. of capacity.

A meeting of wire producers is to be held this week, and the subject of making another price advance will be discussed. The opinion has become more general that an advance will occur by March 1, and it is not impossible that one will be decided upon at the coming meeting. A meeting of the pipe mills is rumored as likely to be held, and in any event it is far from improbable that an advance in pipe will be made. Bookings have been very good in the past few weeks, the great accumulations of jobbers and manufacturing consumers, due to the heavy buying in the fall of 1909, having at last been disposed of. Demand for line pipe and oil country goods has been particularly good.

Pig Iron—The basic pig-iron market has been unusually interesting. Our last report noted bids of $13.50, Valley, being refused. Subsequently several sales were made at $13.60, Valley, and late last week a sale of 2000 tons was made at $13.65, to an Allegheny Valley steel interest. Later another steel interest in the same valley bought 3000 tons, paying either $13.65 or $13.75, Valley, while a sale of about 1500 tons was made at $13.70. The furnaces have for a fortnight or more been asking a minimum of $14, Valley, and the sales at lower prices have been made by middlemen. While there are considerable stocks in the hands of middlemen, it does not appear that they are all for sale at less than the furnace price, but rather that the middlemen are merely selling odd blocks at advancing prices and as the market shows strength are advancing their asking prices on the remainder, so that the market seems in a fair way to work up to $14, Valley. This would be an advance of a clear dollar a ton over what was done last October at the minimum. Meanwhile we quote the market at $13.75 @14, Valley. Nothing is reported in bessemer since the sale of 1000 tons reported last week at $15, Valley, and this figure stands as the market. Foundry iron has been moving more freely, in small lots, and prices have been advancing slightly. The $13.75, Valley, quotation has disappeared, Valley furnaces quoting not lower than $14 at furnace, equal to $14.90, Pittsburg. A furnace having a 75c. rate to Pittsburg would sell at $14, furnace, equal to $14.75, Pittsburg. Two or three sales of small lots of foundry have been made at $14.25. The quotations now given represent an advance of 10 to 15c. in the week. Malleable has sold again at $13.75, Valley.

Ferromanganese—The market continues soft, and we quote $37.50@37.75, for prompt and $38 for forward, f.o.b. Baltimore, freight to Pittsburg being $1.95 per ton.

Steel—The market has grown considerably stronger. One or two large producers have withdrawn from the market at the recognized prices of $23 for billets and $24 for sheet bars, f.o.b., Pittsburg and Youngstown. A sale of slightly more than 2000 tons of special quality open-hearth sheet bars was made last week at $25, Pittsburg. There are sellers of ordinary open-hearth steel at $24, but the buyer was willing to pay $1 additional for the particular quality secured. However, it is a fact that a month earlier the mill making this sale was willing to sell the same quality of steel at $24, so that the sale, while not establishing a new market price at least indicates an advancing tendency. Rods are firm at $29, Pittsburg.

Sheets—In general demand shows no material increase although the trend appears to be in the right direction. The Allegheny Steel Company, which has been operating five of its 18 sheet mills of late, this week started nine additional mills, making 14 in operation. There have been some slight irregularities in prices on galvanized sheets, but not of sufficient importance to be recognized by sellers generally, while black sheets continue to be firmly held. We continue to quote: Black sheets, 28 gage, 2.20c.; galvanized, 3.20.; blue annealed, 10 gage, 1.65c.; painted corrugated roofing, $1.15; galvanizer, $2.75 per square.

St. Louis

Feb. 20—The market in pig iron is a trifle better. A little interest is being shown for second- and third-quarter deliveries, mostly third-quarter. A number of medium sized orders have been placed this week. The current price remains $11 per ton, Birmingham, or $14.75, St. Louis, for No. 2 foundry.

Sault Ste. Marie Canal

The total freight passing through the Sault Ste. Marie canals for the full season was as follows, in short tons:

	1909.	1910.	Changes.
Freight, tons	57,895,149	62,363,218	I. 4,468,068
Vessels, No.	19,204	20,899	I. 1,695
Av. cargo, tons	3,014	2,984	D. 31

In 1910, owing to greater draft in the Canadian lock, that canal bore the larger part of the tonnage. The freight carried through the Canadian canal was 36,435,557 tons as against 25,927,661 tons carried through the American canal. The total of 62,365,218 tons is the largest in lake history, the nearest being that of the season of 1907, when 58,217,214 tons were carried. The United States canal opened May 5 and closed Dec. 14.; the Canadian canal opened April 12 and closed Dec. 15, giving seasons of 247 and 214 days, respectively.

The mineral freights included above were as follows, in short tons, except salt, which is in barrels:

	1909.	1910.	Change02
Coal	9,941,026	13,513,727	I. 3,572,704
Iron ore	40,014,978	41,603,634	I. 1,588,656
Pig and mfd. iron	522,281	444,669	D. 77,611
Copper	127,212	148,070	I. 20,852
Building stone	1,784	9,635	I. 7,858
Salt, bbl.	651,091	528,610	D. 122,481

In 1910 iron ore was 66.7 per cent. of the total freight, and coal 21.7 per cent.

FOREIGN IRON TRADE

Belgian Iron Trade—Exports and imports of iron and steel in Belgium, year ended Dec. 31, metric tons:

	Exports.	Imports.	Excess.
Pig iron	14,695	687,001	Imp. 672,306
Other iron and steel	1,406,190	360,422	Exp. 1,045,768
Total	1,420,885	1,047,423	Exp. 373,462
Total, 1909	1,235,318	828,046	Exp. 407,272

Imports of iron ore in 1910 were 5,182,436 tons; exports, 595,251 tons;

showing increases over 1909 of 835,099 tons in imports and 159,599 tons in exports.

British Foreign Trade—Exports and imports of iron and steel and of machinery in Great Britain, month of January, as valued by Board of Trade returns:

	Exports.	Imports.	Excess.
Iron and steel	£ 3,830,687	£ 825,805	Ex. £ 3,004,882
Machinery...	2,248,083	433,719	Ex. 2,052,364
Cutlery and hardware..	615,390	392,752	Ex. 222,638
New ships....	230,208	.....	Ex. 230,208
Total..... ..	£ 7,162,368	£ 1,652,276	Ex. £ 5,510,092
Total, 1910..	8,188,483	1,318,789	Ex. 6,869,694

Decrease in exports, £1,026,115, or 12.5 per cent.; increase in imports, £333,487, or 25.3 per cent. The total quantities of iron and steel were, in long tons:

	1910.	1911.	Changes.
Exports.....	390,823	384,894	D. 5,929
Imports.....	108,884	129,207	I. 20,323

Imports are largely of crude iron, billets, blooms, etc., which are manufactured into finished forms in British mills.

Ore Imports—Imports of iron ore into Great Britain, for month of January, were 551,982 tons in 1910, and 681,240 in 1911; increase, 129,258 tons. Of the imports this year 485,391 tons were from Spain.

Imports of manganese ore, 64,858 tons in 1910, and 33,253 in 1911; decrease 31,605 tons.

METAL·MARKETS

New York, Feb. 22—The metal markets have been rather quiet, but fairly steady. Tin continues to be the spectacular figure of the markets.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Jan. 1911..	$ 921,360	$ 9,540,830	Imp.$ 8,619,470
" 1910..	6,163,132	2,131,357	Exp. 4,031,775
Year 1911..	921,360	9,540,830	Imp. 8,619,470
" 1910..	6,163,132	2,131,357	Exp. 2,131,357
Silver:			
Jan. 1911..	5,651,076	3,551,426	Exp. 2,099,650
" 1910..	4,498,304	4,248,354	" 249,980
Year 1911..	5,651,076	3,551,426	" 2,099,650
" 1910..	4,498,304	4,248,354	" 249,980

Exports from the port of New York, week ended Feb. 28: Gold, $33,000; silver, $1,506,093, chiefly to London and Paris. Imports: Gold, $70,977; silver, $80,240, chiefly from Mexico and South America.

Gold—The price of gold on the open market in London continued at the normal level, 77s. 9d. per oz. for bars and 76s. 4½d. per oz. for American coin. India is still looking for gold, and there was some demand for Germany also.

Platinum—The market remains quiet but steady with prices about the same as they have been for some time. Dealers quote $38.50@39 per oz. for refined platinum, and $41.50@42 for hard metal, 10 per cent. iridium.

Our Russian correspondent writes, under date of Feb. 2, that quotations remain the same. Crude platinum, 83 per cent., is 8.50 rubles per zolotnik at Ekaterinburg and 32,500 rubles per pood at St. Petersburg—$31.96 and $31.85 per oz. respectively. The Russian Government has decided to establish a refinery for platinum produced in Russia; after it is completed the export of crude platinum will be prohibited.

A well known concern interested in platinum writes us: "We know of nothing particularly new or interesting in the platinum market. Prices still remain high, and from all the information we can gather both here and abroad, there seems to be no likelihood of a fall in the market until after the mines open in Russia, which will not be before some time in April. Even then it is claimed that prices will not break to any appreciable extent. Handlers of the metal state that there is a scarcity of supply and a much increased demand, the electrical industry together with the automobile business taking up larger quantities every year. It is said that last year the demand exceeded the supply by about 30,000 oz. Of course, we cannot vouch for the truth of this, although we get it from the best authorities."

Silver—Owing to China becoming a buyer instead of a seller, the market for the past week has shown more firmness and the price has advanced to 24 3/16d.

SILVER AND STERLING EXCHANGE

Feb.	16	17	18	20	21	22
New York....	51⅞	52⅛	52⅛	52⅜	52⅛	....
London .	23 1/16	24 1/16	24 1/16	24 1/16	24 1/16	....
Sterling Ex..	4.8605	4.8620	4.8625	4.8625	4 8630	....

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Shipments of silver from London to the East, Jan. 1 to Feb. 9, as reported by Messrs. Pixley & Abell:

	1910.	1911.	Changes.
India.....	£1,061,400	£1,332,300	I. £270,900
China.....	202,000	176,000	D. 26,000
Total.....	£1,263,400	£1,508,300	I. £244,900

India Council bills in London brought an average of 16.09d. per rupee for the week.

The Treasury Department estimates the stock of coined silver in the United States on Feb. 1 at $723,038,402, of which $158,186,894 is subsidary coinage and $564,851,508 silver dollars. Of the silver dollars $84,848,508 are in circulation or treasury balances; $480,003,000 being held against silver certificates outstanding.

The gold coin in the United States on Feb. 1 is estimated by the Treasury Department at $1,718,936,137; of which $597,287,884 is in banks or circulation;

Copper, Tin, Lead and Zinc

NEW YORK

Feb.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Tin. Cts. per lb.	Lead. New York, Cts. per lb.	Lead. St. Louis, Cts. per lb.	Zinc. New York, Cts. per lb.	Zinc. St. Louis, Cts. per lb.
16	12½ @12¾	12 20 @12 30	42	4.40 4.45	4.22½ @4.27½	5 52½ @5.55	5.37½ @5 40
17	12½ @12¾	12.20 @12.25	42⅛	4.40 4.45	4.22½ @4.27½	5.55 @5.60	5.40 @5.45
18	12½ @12¾	12.20 @12.25	42⅛	4.40 4.45	4.22½ @4.27½	5 55 @5.60	5.40 @5.45
20	12½ @12¾	12.20 @12.25	42¾	4.40 4.42½	4.22½ @4.25	5 57½ @5.62½	5.42½ @5.47½
21	12½ @12¾	12.20 @12 30	43	4.40 4.42½	4.22½ @4.25	5 57½ @5.62½	5.42½ @5.47½
22	.....	.....	....	.....	.....	.....	.....

The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

LONDON

Feb.	Copper. Spot.	Copper. 3 Mos	Copper. Best Sel'td	Tin. Spot.	Tin. 3 Mos	Lead, Spanish.	Zinc, Ordinaries.
16	54⅞	55⅛	59	190	187½	12 1/16	23¼
17	54 13/16	55 1/16	58¾	190	186½	12 1/16	23⅛
18	.....	.....	.....	.....	.....	.....	.....
20	55¼	55⅞	59¼	194	188¾	13	23¼
21	55 1/16	55⅞	59¼	194¾	191¼	13	23¼
22	....	....	....	....	....	....	....

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £12 = 2.61c.; £23=5c.; £60 = 13.04c. ± £1 = ± 0.21¾c.

Copper—The market is quiet and steady. Manufacturers both here and abroad report somewhat more business and there has been a fair inquiry for copper from day to day. A moderate business has been done, this including a few large transactions, but it has been at concessions in price, some of the producers having become weary of waiting. During part of the week electrolytic was freely offered at 12⅜c., delivered, usual terms, and transactions were made at prices netting 12.20@12.25c., cash, New York. Toward the close the tendency became firmer. A fair business was reported in Lake copper, good brands fetching 12½@12⅝c., and special brands 12⅝@12¾c. At the close we quote Lake copper at 12½@12¾c., and electrolytic in cakes, ingots and wirebars at 12.20@12.30c. Casting copper is quoted nominally at 11⅞@12⅛c. as the average for the week.

Copper sheets are 18@19c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 13½c. base, carload lots at mill.

The London market for standard copper has been firmer, and closes at £55 3s. 9d., for spot, and £55 17s. 6d. for three months.

Copper exports from New York for the week were 2593 long tons. Our special correspondent gives the exports from Baltimore for the week at 491 tons.

The Osceola company, of Michigan, reports officially the sale of 16,744,258 lb. of copper in 1910 at an average or 13.04c. Our quotational average for 1910 was 13.039 cents.

Brass Prices—The Ansonia Brass Company announces prices as follows, taking effect Jan. 30: High sheet brass, 14¼c. per lb.; low, 15⅝c.; brass wire, high, 14¼c.; low, 15⅝c.; brass rods, high, 14¼c.; low, 16⅜c.; brass tubing, brazed, 19⅜c.; open seam, 17⅜c. Scrap allowances are 8¾c. net per lb. for high brass, and 9⅝c. for low brass.

Tin—While the London market during the period under review fluctuated considerably, transactions decreased in volume and the excitement abated. The Syndicate seems to have taken advantage of the weak spots to accumulate further quantities, and thus to strengthen their hold on the market. Sudden advances in the near future will, therefore, not be surprising.

The feature of this market is the continued scarcity of spot material and the heavy premiums asked. Buying on the part of consumers has been almost *nil,* and only absolute wants were covered. While stocks in warehouses in New York are said to amount to about 1200 tons, they are owned largely by consumers who do not resell, and the balance by the domestic representatives of members of the Syndicate. The London market closes strong at £194 15s. for spot, and £191 5s. for three months, while the New York market quotes spot and February tin at about 44½c. and March at 43 cents.

Messrs. Robertson & Bense report that receipts of tin ore and concentrates at Hamburg, Germany, in January were 732 tons from Germany and 25 tons from South Africa.

Lead—Missouri lead has been more freely offered, and the market has eased off to 4.22½@4.25, St. Louis. On this parity, lead is offered at New York, making the price here 4.40@4.42½ cents.

The foreign market is slightly better, Spanish lead being quoted at £13, and English lead at £13 2s. 6d. per ton.

Spelter—The galvanizing business is looking up and there has been a good demand for spelter. Considerable business was done at advancing prices. The market closes at 5.42½@5.47½c., St. Louis, and 5.57½@5.62½c., New York.

Early in the week the foreign market for spelter was 2s. 6d. lower, but it closes same as last week at £23 5s. for good ordinaries, and £23 10s. for specials.

Zinc dust is quoted at 6⅝c. per lb., New York.

The premium on brass-special spelter has lately been smaller than usual, these brands at present fetching only 5@10c. per 100 lb. over the price for prime western.

Base price of zinc sheets is $7.50 per 100 lb., f.o.b. La Salle-Peru, Ind., less 8 per cent. discount.

Silesian Zinc Market—Paul Speier reports from Breslau, under date of Jan. 30, that prices have been unchanged at 49 marks per 100 kg. for ordinary brands at works—equal to 5.29c. per lb. Zinc sheets are quoted at 57.35@59.35 marks per 100 kg.—equal to 6.30c. per lb., average.

Imports and exports of spelter and zinc products in Germany, year ended Dec. 31, are reported as follows, in metric tons:

	Imports		Exports	
	1909.	1910.	1909.	1910.
Spelter	44,514	39,328	76,183	82,700
Zinc scrap	2,476	1,896	6,043	6,103
Zinc sheets	99	246	18,999	26,623
Zinc dust	835	1,285	3,021	3,091
Zinc pigments	7,002	7,959	26,001	32,259

Imports of zinc ores were 201,110 tons in 1909, and 240,584 in 1910; exports, 51,994 tons in 1909, and 59,440 tons last year.

Other Metals

Aluminum—The market has again been rather quiet, and few sales are reported. We continue to quote 21@21½c. per lb. for No. 1 ingots in large lots, New York.

Antimony—The tone of the market has improved, chiefly owing to the formation of the syndicate abroad and the expectation of higher prices. Cookson's is quoted at 8¼c. per lb.; U. S. at 7¼@7⅞c., while 7¼@7½c. is named for Hungarian and other outside brands.

Quicksilver—Business is good and there has been another sharp advance. The New York quotation is $49.50@50 per flask of 75 lb. for large lots; $52.50@53.50 for jobbing lots. San Francisco, $49 for domestic business and $2 less for export. The London price has advanced 10s. and is now £9 per flask, with the same price quoted by second hands.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots, f.o.b. New York.

Bismuth—The current price of bismuth in London is 7s. 6d.—or $1.80—per lb. This price has been maintained for several months.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 500-lb. lots up to 55c. for 200-lb. lots. The price of electrolytic is 5c. higher.

Cadmium—Current quotations are 60@70c. per lb. in 100-lb. lots, f.o.b. New York, according to quantity of metal. The price in Germany has recently advanced and is now 575@600 marks per 100 kg.; equal to 63.4c. per lb., average.

British Metal Imports and Exports

Imports and exports of metals in Great Britain, month of January, figures in long tons, except quicksilver, which is in pounds:

Metals:	Imports.	Exports.	Excess.	
Copper, long tons	14,124	6,658	Imp.	7,466
Copper, 1910	13,915	5,515	Imp.	8,400
Tin, long tons	3,158	3,472	Exp.	314
Tin, 1910	4,177	3,794	Imp.	383
Lead, long tons	23,501	2,912	Imp.	20,589
Lead, 1910	19,012	3,912	Imp.	15,100
Spelter, l'g tons	10,771	754	Imp.	10,717
Spelter, 1910	11,055	813	Imp.	10,242
Quicksilver, lb.	54,197	350,525	Exp.	296,328
Quicksilver, '10	455,662	54,673	Imp.	400,989
Minor met's, tons	374	1,496	Exp.	1,122
Minor, 1910	392	2,181	Exp.	1,789
Ores:				
Tin ore and con.	2,053	.....	Imp.	2,053
Tin ore, 1910	1,817	.....	Imp.	1,817
Pyrites	97,867	.....	Imp.	97,667
Pyrites, 1910	63,617	.....	Imp.	63,617

Copper totals include metallic contents of ore and matte. Exports include re-exports of foreign material. Miscellaneous metals include nickel, aluminum and the minor metals and alloys. Of the imports in 1910, the United States furnished in all 7254 tons fine copper, and 4410 tons lead. This lead was chiefly Mexican, refined in this country.

Zinc and Lead Ore Markets

Joplin, Mo. Feb. 18—The highest price paid for zinc sulphide ore was $45.50, the base prices ranging from $39 to $42.50 per ton of 60 per cent. zinc. Zinc silicate ore sold at $20@23 per ton of 40 per cent. zinc. The average price, all grades of zinc, was $40. The highest offering reported on lead ore this week was $56 per ton, with offers as low as $55, but some of the ore shipped this week was settled for at $57@58, having been purchased one or two weeks ago. Average $55.48 per ton.

SHIPMENTS, WEEK ENDED FEB. 18.

	Zinc lb.	Lead lb.	Value.
Webb City-Carterville	4,003,600	1,865,000	$132,292
Joplin	1,908,200	344,330	48,312
Alba-Neck	738,050	.....	16,975
Oronogo	642,960	67,350	14,388
Galena	533,550	84,860	12,962
Duenweg	341,800	16,860	6,865
Spring City	342,250	24,560	5,942
Miami	61,600	156,000	5,214
Jackson	221,270	.....	4,425
Badger	208,470	.....	4,169
Carl Junction	144,950	.....	3,188
Aurora	123,090	.....	2,461
Carthage	119,150	.....	2,383
Granby	116,570	2,460	1,640
Stott City	62,400	.....	1,248
Totals	9,568,010	2,561,420	$262,464
7 weeks	64,149,560	12,062,990	$1,609,043

Zinc value, the week, $191,393; 7 weeks, $1,273,661
Lead value, the week, 71,071; 7 weeks, 335,382

The zinc market was $1@3 per ton higher, on the base price, than last week, the medium and lower grades coming in for the heaviest advances. Attempts were made to purchase a considerable portion of the reserve stock, but as it is in the hands of the companies able to hold an unlimited time, little progress was made, and failing in this prices eased off at the week-end. Heavy rain set in Friday night, continuing all day Saturday, and lessened the shipment below the purchases. It seems probable tonight that trouble may be expected at many mines from the excess of rain.

MONTHLY AVERAGE PRICES.

Month.	Zinc Ore.				Lead Ore.	
	Base Price.		All Ores.		All Ores.	
	1910.	1911.	1910.	1911.	1910.	1911.
January	$47.31	$41.85	$45.16	$40.55	$56.99	$55.68
February	40.69	.....	39.47	.....	53.64	.....
March	43.60	.....	39.71	.....	51.26	.....
April	41.00	.....	39.33	.....	49.72	.....
May	40.19	.....	37.51	.....	48.16	.....
June	40.20	.....	37.83	.....	48.80	.....
July	39.63	.....	36.80	.....	48.59	.....
August	40.13	.....	37.32	.....	49.75	.....
September	43.45	.....	39.96	.....	54.73	.....
October	43.31	.....	40.50	.....	53.18	.....
November	47.20	.....	43.20	.....	54.80	.....
December	42.50	.....	40.70	.....	55.70	.....
Year	$42.43	.....	$39.79	.....	$52.12	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Other Ore Markets

Iron Ore—The Lake Superior season is closed and all buying of ore will now be done on next year's prices. No action has yet been taken toward fixing them.

In the East there is no organization of sellers, and no general quotations can be given. It may be said, however, that prices on the open market will range from 7 to 8c. per unit of iron delivered to furnace; which would be $3.50@4 for a 50 per cent. ore. Most ores, however, are sold under yearly contracts.

Manganese Ore—The base price, as fixed by large buyers, is 25c. per unit for manganese and 5c. per unit for iron content, for a base ore containing 49 per cent, or over in manganese, not over 0.20 phosphorus and 8 per cent. silica. Prices range down to 23c. per unit for 40 per cent. manganese; with deductions for excess of phosphorus and silica.

Tungsten Ore—Ferberite, wolframite and huebnerite ores, $6.50@7 per unit per ton of 2000 lb. of ore containing 60 per cent. of tungsten trioxide. For scheelite ore, 50c.@$1.50 per unit less.

Zinc Ores—For Rocky Mountain blende of good quality, especially as to iron and lead contents, the current price is for the zinc content, less 8 units, at the St. Louis price of spelter; with a deduction of $14@15 per 2000 lb. of ore. See also Joplin and Wisconsin ore markets.

Pyrites—Domestic pyrites are quoted at 11½@12c. per unit of sulphur at mines for furnace sizes. Spanish pyrites, furnace sizes, are 12@12½c. per unit, ex-ship. Arsenical pyrites are from ½@1¼c. per unit less.

CHEMICALS

New York, Feb. 22—There is little change reported in the general markets.

Copper Sulphate—On a moderate business prices are unchanged at $4 per 100 lb. for carload lots, and $4.25 per 100 lb. for smaller orders.

Arsenic—Business is still dull and $2 per 100 lb. is quoted for white arsenic.

Phosphate—Exports of phosphates from Tunis, chiefly to France, were 1,281,795 metric tons in 1910, an increase of 54,-972 tons over 1909. Of the total exports 950,000 tons were made by the Compagnie de Gafsa. Prices were steady through 1910, the average realized being 10.23c. per unit for 63-70 per cent., and 9.65c. per unit for 58-62 per cent. rock.

Nitrate of Soda—Business is a little better and promises to improve further. The current quotations remain unchanged at 2.10c. per lb. for both spot and future positions.

Petroleum

Production of oil in the Baku district in Russia in 1910 is reported at 478,500,-000 poods, or 7,834,480 metric tons; a decrease of 11,800,000 poods, or 2.2 per cent., from the previous year.

The production of crude petroleum in Rumania in 1910 was 1,357,000 metric tons; an increase of 60,000 tons, or 4.6 per cent., over the previous year.

MINING STOCKS $

New York, Feb. 22—The general stock markets this week have seen a reaction from the slow advance which has been going on for some time. At present they are rather in suspense, owing to the general belief that the Interstate Commerce Commission will soon come to a decision on the railroad rate question.

The Curb market was a little reactionary also. It was quite irregular and rather uncertain in its tendency. The copper stocks were not specially active, but held their quotations fairly well. Cobalt stocks were the firmest section of the market, but only moderately active.

Boston, Feb. 20—"*Status quo*" about describes the local copper-share market. Changes have been slight during the week, although a generally firm tone is maintained. Utah Consolidated attracted attention with a $3 rise to $14. The buying of this stock has been by one house and it is said to be for inside account. This company finds it advantageous to gather in adjoining mines, and as a result, rumor puts it that the Bingham-New Haven property has been acquired. It is generally expected that before the annual meeting of the company, the third Tuesday of April, that there will be a scramble for proxies to maintain the present management.

Calumet & Hecla subsidiary stocks are quoted spasmodically, but at slightly changed prices. The report of the Stock Exchange committee relative to the

COPPER PRODUCTION REPORTS.
Copper contents of blister copper, in pounds.

Company.	November.	December.	January.
Anaconda	21,900,000	21,500,000	21,000,000
Arizona, Ltd.	3,010,000	3,224,000	3,024,000
Balaklala	.....	160,000	.....
Copper Queen	7,372,776	.....	7,298,227
Calumet & Ariz.	1,930,000	1,900,000	2,044,000
Detroit	1,840,939	.....	2,017,397
East Butte	618,191	870,812	1,134,000
Imperial	*nil*	.....	.....
Mammoth	.....	.....	.....
Nevada Con.	5,207,353	5,510,936	.....
Old Dominion	2,754,000	2,287,000	2,095,000
Shannon	1,420,000	.....	1,250,000
Superior & Pitts.	2,160,000	2,175,000	2,014,000
United Verde*	3,000,000	.....	3,000,000
Utah Copper Co.	7,468,515	7,137,585	.....
Lake Superior*	20,400,000	20,000,000	.....
Non-rep. mines*	13,200,000	13,100,000	.....
Total production.	92,281,775	.....	.....
Imports, bars, etc.	24,835,954	25,192,854	.....
Total blister	117,117,629	.....	.....
Imp. in ore & matte	5,542,279	9,316,091	.....
Total	122,660,608	.....	.....
Brit. Col. Cos.:			
British Col. Copper	917,994	.....	.....
Granby	1,410,261	1,645,613	.....
Mexican Cos.:			
Boleo	.....	2,766,630	2,647,173
Cananea	3,658,000	.....	.....
Moctezuma	1,654,235	.....	1,738,429

Figures are reports received from companies, unless otherwise stated. Boleo copper does not come to American refiners.
*Estimated.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
I, 1910	116,547,287	78,158,387	81,691,672
II	112,712,493	66,618,322	37,369,518
III	120,067,467	62,844,818	40,585,767
IV	117,477,639	67,985,951	31,332,434
V	123,242,476	59,305,222	45,495,400
VI	127,219,188	53,363,196	65,895,948
VII	118,370,003	56,708,175	59,407,167
VIII	127,803,618	67,731,271	61,831,780
IX	119,519,983	64,501,018	75,106,496
X	126,469,284	67,814,172	68,186,912
XI	119,353,463	60,801,992	67,424,316
XII	123,339,219	43,594,018	88,104,075
Year 1910	1,452,122,120	749,426,542	722,431,494
I, 1911	115,696,591	42,078,567	53,208,739

	Visible Stocks.		
	United States.	Europe.	Total.
II, 1910	98,463,339	248,236,800	346,700,139
III	107,187,992	254,150,400	361,338,392
IV	123,824,874	249,625,600	373,450,474
V	141,984,159	246,870,400	388,854,559
VI	160 425,973	239,142,400	399,568,373
VII	168,386,017	232,892,800	401,278,818
VIII	170,640,678	222,320,000	392,960,677
IX	168,881,245	218,444,800	387,326,045
X	148,793,714	211,276,800	360,070,514
XI	139,261,914	198,060,800	337,322,714
XII	130,389,069	193,200,000	323,589,069
I, 1911	122,030,195	187,797,120	309,827,315
II	142,439,490	186,368,000	328,807,490

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

merger was favorable, but more or less of a sop to the plan. The recommendation that a holding company be organized to take over the parent company is well received by the public, but not by Calumet & Hecla officials. The "street" would be better pleased were there a larger number of shares and a selling price around $50 per share, rather than $200. This would naturally give a broader market for the stock and also a more speculative flavor, which is what stock-market interests want.

Curb trading has been quiet and almost without feature. First National and Rhode Island Coal both show better market action. Amalgamated Nevada, which had a perpendicular rise from 12 to 25c., is back close to the former figure again.

Assessments

Company.	Delinq.	Sale.	Amt.
Advance, Mont.	Feb. 1	Mar. 1	$0.003
Aeolian, Ida	Mar. 1	Mar. 18	0.005
Albion, Utah	Feb. 23	Mar. 27	0.13
Capital, Ida	Feb 10	Mar. 10	0.002½
Con. Virginia, Nev.	Feb. 7	Feb. 28	0.25
Eastern Star, Ida.	Mar. 4	Apr. 4	0.002
Emma, Utah	Mar. 15	Apr. 10	0.005
Florence M. & M., Ida.	Feb. 20	Mar. 20	0.001
Grant, Ida	Feb. 27	Mar. 27	0.003
Great Eastern, Ida	Feb. 9	Mar. 9	0.003
Hancock Con., Mich.	May 1		1.00
Helvetia Copper, Ariz.	Feb 15		0.50
Independence, Utah	Mar. 9	Mar. 25	0.007
Missoula Copper, Ida.	Mar. 13	Apr. 5	0.005
Lower Mammoth, Utah.	Feb. 11		0.05
Lucky Swede, Ida	Apr. 1	May 1	0.002
Pandora, Ida.	Jan. 30	Feb. 28	0.003
Rexall, Utah	Feb. 18	Mar. 20	0.005
Savanna, N. M.	Mar. 1		0.50
Selma, Utah	Feb. 15	Mar. 15	0.00½
Silver Crown, Ida.	Mar. 21	Apr. 21	0.001
Spokane Tunnel, Ida.	Feb. 18	Mar. 11	0.002
Sunrise, Ida.	Feb. 18	Mar. 11	0.003
Super'r & Boston Cop., Ariz.	Feb. 20		1.00
Tonopah North Star, Nev.			0.03
Treasure, Cal.	Feb. 10	Mar. 3	0.05

Monthly Average Prices of Metals

SILVER

Month.	New York.			London.		
	1909.	1910.	1911.	1909.	1910.	1911.
January	51.750	52.375	53.795	23.843	24.154	24.865
February	51.472	51.534	.....	23.706	23.794	.....
March	50.468	51.454	.....	23.227	23.690	.....
April	51.428	53.221	.....	23.708	24.483	.....
May	52.905	53.870	.....	24.343	24.797	.....
June	52.538	53.462	.....	24.166	24.651	.....
July	51.043	54.150	.....	23.519	25.034	.....
August	51.125	52.912	.....	23.588	24.428	.....
September	51.440	53.295	.....	23.743	24.567	.....
October	50 923	55.490	.....	23.502	25.596	.....
November	50.703	55.635	.....	23.351	25.680	.....
December	52.226	54.428	.....	24.030	25.160	.....
Total	51.502	53.486	.....	23.706	24.670	.....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	New York.				London, Standard.	
	Electrolytic		Lake.			
	1910.	1911.	1910.	1911.	1910.	1911.
January	13.620	12.295	13.870	12.680	60.923	55.604
February	13.332	.....	13.719	.....	59.388	.....
March	13.255	.....	13.586	.....	59.214	.....
April	12.733	.....	13.091	.....	57.238	.....
May	12.550	.....	12.885	.....	56.313	.....
June	12.404	.....	12.798	.....	55.310	.....
July	12.215	.....	12.570	.....	54.194	.....
August	12.490	.....	12.715	.....	55.733	.....
September	12.379	.....	12 668	.....	55.207	.....
October	12.553	.....	12.788	.....	56.722	.....
November	12.742	.....	12.914	.....	57 634	.....
December	12.581	.....	12.863	.....	56.769	.....
Year	12.738	.....	13.039	.....	57.054	.....

TIN AT NEW YORK

Month.	1910.	1911.	Month.	1910.	1911.
January	32.700	41.255	July	32.695	.....
February	32.920	.....	August	33.972	.....
March	32.403	.....	September	34.982	.....
April	32.976	.....	October	36.190	.....
May	33.125	.....	November	36.547	.....
June	32.769	.....	December	38.199	.....
			Av. Year	34.123	.....

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis.		London.	
	1910.	1911	1910.	1911.	1910.	1911.
January	4.700	4.483	4.582	4.334	13.650	13.009
February	4.613	.....	4.445	.....	13.328	.....
March	4.459	.....	4.307	.....	13.063	.....
April	4.376	.....	4.225	.....	12.641	.....
May	4.315	.....	4.164	.....	12.550	.....
June	4.343	.....	4.207	.....	12.688	.....
July	4.404	.....	4.291	.....	12.531	.....
August	4.400	.....	4.290	.....	12.513	.....
September	4.400	.....	4.289	.....	12.582	.....
October	4.400	.....	4.271	.....	13.091	.....
November	4.442	.....	4.314	.....	13.217	.....
December	4.500	.....	4.363	.....	13.197	.....
Year	4.446	.....	4.312	.....	12.920	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1910.	1911.	1910.	1911.	1910.	1911.
January	6.101	5.452	5.951	5.302	23.350	23.887
February	5.569	.....	5.419	.....	23.188	.....
March	5.637	.....	5.487	.....	23.031	.....
April	5.439	.....	5.289	.....	22.469	.....
May	5.191	.....	5.041	.....	22.100	.....
June	5.128	.....	4.978	.....	22.094	.....
July	5.152	.....	5.002	.....	22.406	.....
August	5.279	.....	5.129	.....	22.800	.....
September	5.514	.....	5.364	.....	23.165	.....
October	5.628	.....	5.478	.....	23.900	.....
November	5.976	.....	5.826	.....	24.083	.....
December	5.624	.....	5.474	.....	24.019	.....
Year	5.520	.....	5.370	.....	23.050	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG.

	Bessemer.		Basic.		No. 2 Foundry.	
	1910.	1911.	1910.	1911.	1910.	1911.
January	$19.90	$15.90	$17.98	$14.40	$17.94	$14.75
February	18.96	.....	17.21	.....	17.38	.....
March	18.53	.....	16.93	.....	17.00	.....
April	18.28	.....	16.84	.....	16.75	.....
May	17.10	.....	15.94	.....	16.18	.....
June	16.52	.....	15.60	.....	15.53	.....
July	16.40	.....	15.40	.....	15.40	.....
August	16.09	.....	14.89	.....	15.16	.....
September	15.92	.....	14.73	.....	14.93	.....
October	15.90	.....	14.05	.....	14.88	.....
November	15.84	.....	14.26	.....	14 78	.....
December	15.90	.....	14.15	.....	14.65	.....
Year	$17.10	.....	$15.65	.....	$15.83	.....

STOCK QUOTATIONS

COLO. SPRINGS Feb. 20

Name of Comp.	Bid.
Acacia	.04
Cripple Cr'k Con.	.02
C. K. & N.	.14
Doctor Jack Pot	.07½
Elkton Con.	.70
El Paso	.72½
Findlay	.05
Gold Dollar	.12½
Gold Sovereign	.02½
Isabella	.17½
Jack Pot	.07
Jennie Semple	.10
Lexington	.01½
Moon Anchor	.03
Old Gold	.03½
Mary McKinney	.45
Pharmacist	.02½
Portland	1.00
Vindicator	.88
Work	.03½

SALT LAKE Feb. 20

Name of Comp.	Bid.
Beck Tunnel	.23½
Bingham Copper	‡.15
Black Jack	.11½
Carisa	.15
Colorado Mining	.47
Columbus Con.	.12
Daly Judge	‡4.45
Grand Central	.75
Iron Blossom	1.07½
Little Bell	.50
Lower Mammoth	.11½
Mason Valley	9.00
Maj. Mines	‡.53
May Day	.13½
Nevada Hills	2.40
New York	‡.13
Prince Con	.66
Silver King Coal'n	1.90
Sioux Con.	.40
Uncle Sam	.70

SAN FRANCISCO Feb. 20.

Name of Comp.	Clg.	Name of Comp.	Bid.
COMSTOCK STOCKS		MISC. NEV. & CAL.	
Alta	‡.05	Belmont	6.15
Belcher	.70	Jim Butler	.28
Best & Belcher	.32	MacNamara	.14
Caledonia	.32	Midway	.14
Challenge Con.	.11	Mont.-Tonopah	.95
Choliar	.14	North Star	.04
Confidence	.45	West End Con.	.55
Con. Virginia	1.25	Atlanta	.12
Crown Point	.70	Booth	.05
Gould & Curry	.15	C.O.D. Con.	.09
Hale & Norcross	.17	Comb. Frac.	.12
Mexican	1.62½	Jumbo Extension	.30
Occidental	.45	Oro	.03
Ophir	1.25	Silver Pick	.05
Overman	.28	St. Ives	.05
Potosi	.25	Tramps Con.	.03
Savage	.14	Argonaut	1.60
Sierra Nevada	.25	Bunker Hill	6.50
Union Con.	.55	Cent. Eureka	1.45
Yellow Jacket	.32	So. Eureka	6.50

N. Y. EXCH. Feb. 20

Name of Comp.	Clg.
Amalgamated	64¾
Am. Agri. Chem.	51½
Am.Sm.&Ref.,com	79⅝
Am. Sm. & Ref., pf.	105⅛
Anaconda	39½
Batopilas Min.	2⅛
BethlehemSteel pf	63
Federal M. & S., pf.	63
Goldfield Con.	6¾
Great Nor., ore ctf.	62½
Homestake	85½
Nat'nalLead,com.	56¾
National Lead, pf.	107⅛
Nev. Consol.	19⅜
Pittsburg Coal,pf.	71
RepublicI&S,com.	34½
Republic I & S, pf.	99⅛
SlossSheffi'd,com.	55
Sloss Sheffield, pf.	110
Tennessee Copper	38½
Utah Copper	45⅞
U. S. Steel, com.	81⅛
U. S. Steel, pf.	119¼
Va. Car. Chem.	66⅝

N. Y. CURB Feb. 20

Name of Comp.	Clg.
Ariz.-Cananea	‡3⅝
Barnes King	‡⅛
Braden Copper	3.93¾
B. C. Copper	6½
Buffalo Mines	‡2.27½
Butte Coalition	19
Caledonia	‡11⅛
Calumet & Mont.	.10
Chino	22¾
Cobalt Central	.08
Con. Ariz. Sm.	1¼
Davis-Daly	1.37½
Ely Con.	.32
El Rayo	‡2⅛
Florence	1¾
Giroux	6⅛
Greene Cananea	6¼
Greenwater	.05½
Guanajuato	3⅜
Guerrero	‡1⅛
Guggen. Exp.	215
Inspiration	8¼
Internat. S. & R.	‡131
Kerr Lake	6⅛
La Rose	5
McKinley-Dar-Sa.	11⅛
Miami Copper	20¼
Mines Co. of Am.	5⅛
Mont. Shoshone	‡.10
Nev. Utah M. & S.	1⅛
Nipissing Mines	11⅛
Ohio Copper	1⅛
Pacific Sm. & M.	⅛
Precious Metals	1⅛
Ray Central	1½
Ray Con	17¾
Red Warrior	‡1½
South Utah M. & S.	.93¾
Standard Oil	630
Stewart	1⅛
Tonopah	8⅛
Tonopah Ex.	1.07
Tri-Bullion	.56¼
Tularosa	37½
Union Mines	⅛
Yukon Gold	3.96

LONDON Feb. 21

Name of Comp.	Clg.
Camp Bird	£1 14s 3d
Dolores	1 10 0
El Oro	1 5 0
Esperanza	1 13 9
Mexico Mines	7 7 6
Oroville	0 7 6
Stratton'sInd.	0 2 0
Tomboy	0 15 0

BOSTON EXCH. Feb. 20

Name of Comp.	Clg.
Adventure	5½
Algomah	‡8⅛
Allouez	‡35
Am. Zinc	24½
Arcadian	3
Arizona Com.	15¼
Atlantic	3⅞
Bonanza	‡.50
Boston & Corbin	.12½
Butte & Balak	6
Calumet & Ariz.	52¼
Calumet & Hecla	505
Centennial	12
Con. Mercur	.05
Copper Range	68½
Daly-West	3⅛
East Butte	13
Franklin	10½
Granby	35
Hancock	22
Helvetia	1¾
Indiana	13⅜
Isle Royale	13½
Keweenaw	2
Lake	36¾
La Salle	4¾
Mass	7
Michigan	2¾
Mohawk	44½
New Arcadian	‡3
North Butte	29½
North Lake	6½
Ojibway	6
Old Dominion	40
Osceola	110
Parrot	12½
Quincy	67
Shannon	11½
Shattuck-Ariz	21½
Superior	36½
Superior & Bost.	5½
Superior & Pitts.	14⅞
Tamarack	44½
Trinity	4¼
U. S. Smelting	35⅞
U. S. Smelt'g, pf.	47¼
Utah Apex	2¾
Utah Con.	13¾
Victoria	2
Winona	8¾
Wolverine	120
Wyandot	1½

BOSTON CURB Feb. 20

Name of Comp.	Last.
Ahmeek	180
Bingham Mines	2.75
Boston Ely	.98
Boswyocolo	.07¾
Cactus	.19
Calaveras	2.06½
Champion	.03
Chief Cons	1.43¾
Cons. Ariz.	1.28
Corbin	4
Cortez	2.62½
Crown Reserve	2.81½
First Nat. Cop.	2.25
Live Oak	19½
Mackinaw	.09
Majestic	.37
Nat'l Mine & Ex.	‡.03
Nevada-Douglas	2.37½
Oneco	1.62½
Raven Copper	.35
Rhode Island Coal	5.25
San Antonio	‡5
South Lake	6.12½
Trethewey	1⅛
Tuolumne Copper	4.78
United Zinc, pfd.	5½
Vulture	.07¾
Yuma	22½

‡Last quotation.